SIBOGA-EXPEDITIE

Siboga-Expeditie

UITKOMSTEN

OP

ZOOLOGISCH, BOTANISCH, OCEANOGRAPHISCH EN GEOLOGISCH GEBIED

VERZAMELD IN

NEDERLANDSCH OOST-INDIË 1899 – 1900

AAN BOORD **H. M. SIBOGA** ONDER COMMANDO VAN

Luitenant ter zee 1e kl. G. F. TYDEMAN

UITGEGEVEN DOOR

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(met medewerking van de Nederlandse Maatschappij voor
Natuurwetenschappelijk Onderzoek van Oost- en West-Indië)

LEIDEN
E. J. BRILL
1952

Siboga Expeditie
XXXIXa[10]

THE

DECAPODA OF THE SIBOGA EXPEDITION

PART XI

THE PALAEMONIDAE

COLLECTED BY THE SIBOGA AND SNELLIUS EXPEDITIONS
WITH REMARKS ON OTHER SPECIES II.

SUBFAMILY PONTONIINAE

BY

DR. L. B. HOLTHUIS
(Rijksmuseum van Natuurlijke Historie, Leiden)

With 110 figs. in the text

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Printed in the Netherlands

THE PALAEMONIDAE COLLECTED BY THE SIBOGA AND SNELLIUS EXPEDITIONS, WITH REMARKS ON OTHER SPECIES. II.

SUBFAMILY PONTONIINAE

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With 110 textfigures

INTRODUCTION

In 1917 Borradaile gave a revision of the Pontoniinae, with keys to all genera and species; of every species the most important references to literature were cited. The division of the subfamily into genera adopted by Borradaile in his paper is not very satisfactory. The division given by Kemp (1922) in his study on the Pontoniinae of the Indian Museum at Calcutta, is much more preferable. As a result of the study of the present material, however, I disagree in some points with Kemp's system. Gurney (1938) on account of the study of Pontoniid larvae also raises some objections against the division given by Kemp; he points out that the study of the mouthparts of the present group is much neglected and that these mouthparts may prove to be of large value. As the material at my disposal contains numerous species, belonging to the larger part of the known genera, I had a good opportunity for comparing the mouthparts of the various forms. The results of this study of the mouthparts are given here:

Mandible. The incisorprocess generally ends in three broad teeth, this number sometimes, by reduction of the median tooth, may become two; sometimes the number of teeth may increase to 4,5 or even up to 12, in some species the distal margin of the process is crenulate (figs. 52a, 55a). Moreover the concave margin of the incisor process may be serrate, the teeth, however, generally are inconspicuous (figs. 17a, 71a, 78a). In some species of *Periclimenaeus* and *Typton* the incisorprocess is strongly reduced, while in one species of the latter genus it even is entirely lacking. These differences in the shape of the incisor process in my opinion are of no generic value, as mostly gradual transitions occur and as in closely related forms the incisorprocess may differ largely in shape. Gurney (1938) pointed to the presence or absence of brush-like arranged spines on the molar process as a probable character of generic value. This showed to be not true: in most Pontoniinae these spines are present,

but of the genus *Periclimenes* some species (e.g. *P. hertwigi, P. nilandensis* and *P. seychellensis*) lack these spines, in others (e.g. *P. impar*) only a small number of these spines is present, while in many species (e.g. *P. scriptus)* they are well developed. The molar process shows no large differences in shape, it mostly is broad and blunt and provided with blunt knobs and ridges in the distal part, in *Periclimenes soror,* however, this process is remarkably slender.

Maxillula. According to Gurney the character of a bifid or uncleft palp of the maxillula probably would prove to be of importance. This too showed to be not correct, as all transitions between a cleft and an entire palp occur within various genera. Also it became clear that the character of the broadened or slender inner lacinia of the maxillula, as it is used by Kemp (1922) for distinguishing large groups of genera, is not constant within those genera. Species belonging to genera as *Palaemonella* and *Periclimenes,* it is true, always have the lacinia more or less slender, but in genera as *Anchistus, Paranchistus* and *Pontonia,* in which it should be very broad, it is strongly variable. This character therefore can not be used for the distinction of larger groups.

First maxilliped. Gurney pointed to two characters of this appendage, which might prove to be of generic value, namely the presence or absence of a distinct notch between coxa and basis and the width of the caridean appendage of the exopod. These characters too proved to be too variable to be of generic importance, though they are, as far as I can control, constant within the species.

I come therefore to the conclusion that the most important characters of generic value derived from the oral parts in this subfamily are: the absence or presence of a palp on the mandible, and the absence or presence of the exopod of the maxillipeds. The characters of the mouthparts described above in my opinion only may be considered to be of specific value. As the oral parts of the present subfamily are so insufficiently known, I have described and figured these parts of most species examined by me; this may be helpful to later workers in this group to investigate the variability in the shape of these organs.

The system of the Pontoniinae adopted by me in the present paper differs from that used by Kemp (1922) in the following points:

1. The genus *Urocaridella* Borradaile (1915) is placed by Borradaile (1917a) as well as by Kemp (1922) in the subfamily Pontoniinae. It can, however, not be maintained in that group, but has to be placed in the subfamily Palaemoninae. The third maxilliped namely is provided with a pleurobranch as well as with an arthrobranch, as is distinctly shown by my material of the typespecies *Urocaridella gracilis* Borradaile. *Urocaridella* even shows to be identical with *Leander* Desm. The name of *Urocaridella gracilis* Borr. thus should have to become *Leander gracilis* (Borradaile, 1915); this name, however, is already used for *Leander gracilis* Smith (1869). The former species thus needs a new name for which that of *Leander urocaridella* was proposed (Holthuis, 1950a, p. 28). *Urocaridella borradailei* Stebbing (1923) belongs to the genus *Macrobrachium* Bate, it thus also is a Palaemonid prawn.

2. The subgenus *Periclimenaeus* of the genus *Periclimenes* is considered here to be a distinct genus.

3. The genus *Harpilius* as defined by Kemp, in my opinion forms no unity. In the present paper the species *Harpilius lutescens* Dana is placed in the genus *Periclimenes,* becoming thereby the type of the subgenus in which the dactylus of the last three legs is simple and which was given by Kemp (1922) the name *Ancylocaris* Schenkel (1902); as, namely, the name *Harpilius* Dana (1852) is older than *Ancylocaris,* Dana's name has to be used for the subgenus. The species

Harpilius depressus and *H. beaupresi* differ in so many respects from the other two species, that I follow Borradaile (1917a) in placing them in a separate genus *Harpiliopsis* Borr. For the fourth species placed by Kemp in the genus *Harpilius, H. gerlachei*, a new genus is erected here, the necessity of which was already supposed by Tattersall (1921) and Gurney (1938).

4. As pointed out by Gordon (1935) the genus *Anchistioides* Paulson (1875) belongs to the present subfamily. Gurney (1938) erects a new subfamily for this genus, but in my opinion too little data are known at present to justify such a separation.

5. The following new genera are erected in the present paper: *Vir, Paranchistus, Philarius, Platycaris, Jocaste, Cavicheles,* and *Hamodactylus.*

The material at my disposal is of large value as it contains many species, which up till now were insufficiently known. Furthermore it forms an important contribution to our knowledge of the Pontoniid fauna of the Malay Archipelago. Up to the present time namely only 23 species of Pontoniinae were known from the Malay Archipelago, 22 of which were recorded from Indonesia and only three from the Philippines. At present the total number of forms from the Malay Archipelago has increased to 69 species and 4 varieties, 67 species and 4 varieties of which come from Indonesia and Dutch New Guinea, 10 species from the Philippines (9 of which from the Sulu Archipelago). 53 species and 1 variety are collected by the Siboga Expedition, 29 species and 2 varieties by the Snellius Expedition, while the number of species of Pontoniinae in the collections of the Rijksmuseum van Natuurlijke Historie at Leiden and the Zoological Museum at Amsterdam is relatively small.

During a stay in Turin and Genoa, I examined the indo-westpacific Pontoniinae of the Istituto e Museo di Zoologia della Università in Turin and the Museo Civico di Storia Naturale in Genoa. Some material of the former Museum was received on loan and was studied in Leiden. The results of the examination of the above material is incorporated in the present paper. I wish to express my deepest gratitude to the directors and the staff of these Musea for the kindness and help received during my visit.

The first Pontoniid prawns ever recorded from the indo-westpacific region are Rumphius's "Pinnewachters" from Amboina. Rumphius (1705, 1740, 1741, p. 25) described them as follows: "*Pinnoteres* is een kleen Garneeltje, op het meeste een pink, maar gemeenlyk twee leeden van een vinger lang, week en dun van schaal, gemeenlyk licht of vuurig rood, met witte puntjes gespikkelt, zomtyds ook licht blauw en half doorschynend, gelyk donker kristal, of ys. Ter wederzyden heeft hy drie dunne pootjes, en voor de schaeren by den mond, noch twee kleender. De schaeren zijn voor zeer spits, scherp, en krom als klauwen, waar mede hy zeer fel nypt, laatende zig eer de schaer aftrekken, dan dat hy ze zou loslaaten. Den staert draagt hy meest onder den buik, gekromt, gelyk alle Garneelen, waar aan men subtyle pinnetjes ziet, waar mede hy zyne eyeren bedekt." (*Pinnoteres* is a small prawn, at most of the length of the little finger, but commonly as long as two joints of a finger, with a soft and thin shell, commonly pale or fiery red, speckled with white dots, sometimes pale blue and semitransparent, like dark cristal or ice. At both sides it bears three thin legs (third to fifth pereiopods), and then two smaller legs before the chelae near the mouth (third maxilliped and first pereiopod). The chelae anteriorly are very acute and sharp, curved like claws; it pinches very fiercely with these chelae and rather let itself pull out a chela, than to release its hold. The tail, at which the subtile fins, with which it covers the eggs, are visible, is like in all prawns curved under the belly.) Rumphius found these Pontoniids in "de *Chama Squamata* of

Nagelschulpen" (*Tridacna squamosa* Lam.) [1]). He also mentions the species from *Pinna rumphii* Hanl. [1]) (see pp. 25 and 153 of Rumphius's book) and tells Pliny's fantastic story about the relation between *Pinnotheres* and *Pinna.* At the end of the 23rd chapter Rumphius makes a very interesting statement: "In de Letterschulpen heb ik, in Oogstmaand 1683, tweederlei Wagtertjes gevonden, de eerste was een Garneeltje ter lengte van eenen vingernagel, hoog oranje, geel en half doorschynend, met dunne witte pootjes. Het ander was een Krabbetje..." (In August 1683 I found two species of "Guards" in the Lettershells (*Tapes litterata* L.) [1]), the first was a small prawn of the length of a fingernail, bright orange yellow and semitransparent, with thin white legs. The other was a small crab...). This observation of Rumphius is very interesting as after him no mention has ever been made of a Pontoniid prawn inhabiting a species of *Tapes.* The exact identification of Rumphius's species is not possible, his first species may belong to the genera *Anchistus, Paranchistus* or *Conchodytes,* the second to *Anchistus* or *Conchodytes.*

The most striking feature of the present group is the fact that a large number of its species is associated with other animals. Kemp (1922) gave a survey of the hosts of the Pontoniinae, but as after the publication of Kemp's paper many more facts about this commensalism have become known, I thought it useful to give here in tabular form the relation between the Pontoniinae and animals of other groups as far as it is known to me (see the table at the end of this paper).

Key to the genera and subgenera of Pontoniinae

1.	Mandibular palp present	2
—	Mandibular palp absent	3
2.	Hepatic spine present. Free living or epizootic on Crinoidea	*Palaemonella*
—	Hepatic spine absent. Epizootic on Crinoidea	*Vir*
3.	Scaphocerite well developed	4
—	Scaphocerite rudimentary	31
4.	All maxillipeds provided with exopods	5
—	Exopods absent at least from third maxilliped	23
5.	Dactylus of last three pereiopods without basal protuberance; sometimes the dactylus is broadened in the basal region, but this broadened part disappears in a slit of the propodus, when the dactylus is curved backward	6
—	Dactylus of last three pereiopods with one or two large basal protuberances, which do not disappear from view, when the dactylus is curved backward	17
6.	Pleurae of first five abdominal segments broadly rounded or bluntly pointed, never produced to a sharp point	7
—	Pleurae of at least the fourth and fifth abdominal segments produced to a distinct sharp point	16
7.	Hepatic spine present	8
—	Hepatic spine absent	9
8.	Hepatic spine immovable. Body mostly slender. Rostrum with conspicuous teeth. Free living or epizootic on Porifera, Coelenterata and Echinodermata	*Periclimenes*

1) For the identification of the molluscs in Rumphius's work, Von Martens's (1902) article in the "Rumphius Gedenkboek" is used.

a. Dactylus of last three pereiopods biunguiculate . . . . . subgen. *Periclimenes* s.s.
b. Dactylus of last three pereiopods simple . . . . . subgen. *Harpilius*

— Hepatic spine movable. Body rather clumsy. Rostrum with small teeth, which all are placed close to the apex. Endozootic in Lamellibranchia . . . . . *Paranchistus*

9. Rostrum compressed, mostly provided with teeth 10
— Rostrum depressed or cylindrical, mostly toothless 14

10. Carpus of first pereiopod segmented. First pereiopods unequal . . . . . *Thaumastocaris*
— Carpus of first pereiopod not segmented. First pereiopods equal 11

11. Second pereiopods very unequal in shape and size, larger pereiopod very clumsy. Fingers of larger leg short and broad, with 1-3 teeth, one of which is hammershaped. Outer margin of basal segment of antennular peduncle often triangularly produced before the stylocerite. Endozootic in Porifera and Ascidia, epizootic on corals . . . . . *Periclimenaeus*
— Second pereiopods equal in shape, sometimes more or less unequal in size. Fingers of the second legs elongate, provided with small teeth, never with a hammershaped tooth. Outer margin of basal segment of antennular peduncle without a triangular lateral process 12

12. Rostrum very short, not reaching beyond end of eyestalk, without teeth. Chela of second pereiopod high, fingers with one or two small teeth. Endozootic in Porifera . . . . . *Onycocaris*
— Rostrum reaching distinctly beyond the eyes, mostly provided with teeth. Chela of second pereiopods cylindrical, somewhat swollen, fingers provided with numerous small denticles 13

13. Scaphocerite broad, oval in shape, final tooth failing to reach end of lamella. When teeth are present on the rostrum, then they are very small and placed close to the apex, leaving the larger part of both upper and lower margin entire. Endozootic in Lamellibranchia . . . . . *Anchistus*
— Scaphocerite slender, final tooth reaching beyond lamella. Rostrum with large teeth placed over the entire length of the dorsal margin. Epizootic on corals *Philarius*

14. Telson rather broad, generally with large dorsal spines. One tooth at end of outer margin of uropodal exopod 15
— Telson elongate, with very small dorsal spines. Outer margin of the uropodal exopod ending in two spines, the inner of which is movable. Epizootic on Crinoidea . . . . . *Pontoniopsis*

15. Third maxilliped without arthrobranch. Body not strongly depressed. Anterolateral angle of basal segment of antennular peduncle pointed. Dactylus of last three pereiopods never strongly curved, mostly with one or more accessory teeth behind apex. Endozootic in Mollusca and Ascidia . . . . . *Pontonia*
— Third maxilliped with arthrobranch. Body very strongly depressed. Anterolateral angle of basal segment of antennular peduncle rounded. Dactylus of last three pereiopods simple, strongly curved . . . . . *Platycaris*

16. Body clumsy, not depressed. Carapace and abdomen areolated. Lower margin

of rostrum entire. Pleura of third abdominal segment pointed. Epizootic on Pennatularia . . . . . *Dasycaris*

— Body strongly depressed. Carapace and abdomen smooth. Lower margin of rostrum with teeth. Pleura of third abdominal segment broadly rounded. Epizootic on corals . . . . . *Harpiliopsis*

17. Basal protuberance of dactylus of last three pereiopods double. Epizootic on Echinoidea . . . . . *Stegopontonia*

— Basal protuberance of dactylus of last three pereiopods simple 18

18. A row of 3 or 4 spines on the carapace behind the antennal spine. Second legs with the fingers short and depressed . . . . . *Fennera*

— No spines on the carapace except the antennal and the hepatic. Fingers of second legs laterally compressed 19

19. Body strongly depressed. Basal protuberance of last three pereiopods hoof-shaped. Rostrum mostly with teeth 20

— Body clumsy, not strongly depressed. Basal protuberance of last three pereiopods flat. Rostrum mostly without teeth 21

20. Hepatic spine absent. Second pereiopods equal in shape, though sometimes unequal in size. Epizootic on corals . . . . . *Coralliocaris*

— Hepatic spine present. Second pereiopods very strongly differing in shape. Epizootic on corals . . . . . *Jocaste*

21. Rostrum depressed, without teeth. Antennal spine absent. Endozootic in Lamellibranchia . . . . . *Conchodytes*

— Rostrum compressed. Antennal spine present 22

22. Rostrum without teeth. Basal protuberance of dactylus of last three pereiopods rounded, smooth. Arthrobranch present on third maxilliped. Endozootic in Ascidia . . . . . *Dasella*

— Rostrum provided with teeth. Basal protuberance of dactylus of last three pereiopods pointed, provided with small ventral squamae. Arthrobranch absent from third maxilliped . . . . . *Cavicheles*

23. Pleurae of the first five abdominal segments broadly rounded or bluntly pointed 24

— Pleurae of at least the fourth and fifth abdominal segments produced to a distinct sharp point 29

24. Hepatic spine present 25

— Hepatic spine absent 26

25. Antennal spine present. Dactylus of second pereiopod much longer than fixed finger, hookshaped . . . . . *Hamodactylus*

— Antennal spine absent. Dactylus of second pereiopod as long as the fixed finger, chela normal in shape . . . . . *Waldola*

26. Second maxilliped with a well developed exopod. Dactylus of last three legs biunguiculate. Rostrum compressed, with teeth. Postorbital tubercle present. Free living and endozootic in Porifera . . . . . *Anchistioides*

— Second maxilliped without exopod. Dactylus of last three legs simple. Rostrum at least in the basal part depressed. No postorbital tubercle 27
27. Rostrum entirely depressed, without dorsal teeth 28
— Rostrum compressed in the ultimate part, generally with dorsal teeth . . . *Neopontonides*
28. Rostrum anteriorly ending in a distinct point, being acute or tridentate. Posterior orbital margin never with a distinct notch behind the eye; this margin formed by the anterior margin of the carapace . . . . . *Pontonides*
— Rostrum broadly truncated anteriorly, the anterior margin being straight or dentate. Posterior margin of the orbit formed by a carina, which is placed some distance behind the anterior margin of the carapace. A distinct notch is present in this posterior orbital margin . . . . . *Veleronia*
29. Rostrum with dorsal teeth. Postorbital and antennal spines present, furthermore there are some two more spines present in the median and posterior region of the lateral surfaces of the carapace . . . . . *Balssia*
— Rostrum without teeth. Carapace with at most some postorbital, two antennal and two pterygostomian spines 30
30. Pterygostomian and postorbital spines present. Dactylus of last three legs with a basal protuberance . . . . . *Coutièrea*
— Pterygostomian and postorbital spines absent. Dactylus of last three legs without a basal protuberance . . . . . *Pseudocoutièrea*
31. Exopods present on all maxillipeds. Rostrum present. Dactylus of last three pereiopods biunguiculate. Endozootic in Porifera . . . . . *Typton*
— Second and third maxillipeds without exopods. Rostrum absent. Dactylus of last three pereiopods simple. Endozootic in corals . . . . . *Paratypton*

List of all species of Pontoniinae known at present [1])

Palaemonella Dana, 1852

Type: *Palaemonella tenuipes* Dana

asymmetrica Holthuis, 1951a. Distribution: Galapagos Islands [2]).

atlantica Holthuis, 1951. Distribution: Cape Verde Islands.

holmesi (Nobili, 1907). Synonyms: *Anchista tenuipes* Holmes, 1900; *Periclimenes tenuipes* Rathbun, 1904 (non Borradaile, 1899); *Periclimenes holmesi* Nobili, 1907; *Periclimenes* (*Falciger*) *holmesi* Borradaile, 1917; *Periclimenes* (*Ancylocaris*) *holmesi* Kemp, 1922. Distribution. American West coast from S. California to Ecuador and the Galapagos Islands.

lata Kemp, 1922. Distribution: Andaman Islands, Java, Timor. Vid. p. 22.

longirostris Borradaile, 1915. Distribution: Maldive Archipelago, ? Bali. Vid. p. 28.

pottsi (Borradaile, 1915). Synonym: *Periclimenes* (*Falciger*) *pottsi* Borradaile, 1915; *Periclimenes* (*Cuapetes*) *pottsi* Clark, 1921. Distribution: Torres Strait.

1) As the Zoological Record of 1949 and later could not be consulted, this list may be considered to be complete for species described up to 1948; species described after 1948 have been included as far as they are known to me.

2) Depths only are mentioned if more than 70 m.

tenuipes Dana, 1852. Synonyms: *Palaemonella tridentata* Borradaile, 1898; *Palaemonella elegans* Borradaile, 1915. Distribution: The species is recorded from the entire Indo-Westpacific region, from the Red Sea and Chagos Archipelago to Japan and Hawaii. Some of these records, however, may be based on specimens of the next species. *Palaemonella tenuipes* also has been recorded from the Atlantic (Bermuda), these specimens belong to *Periclimenes* (*Harpilius*) *americanus*. Vid. p. 27.

vestigialis Kemp, 1922. Synonym: *Palaemonella spinulata* Yokoya, 1936. Distribution: Red Sea, Bay of Bengal, Japan, Malay Archipelago, Papua, Hawaii. Vid. p. 24.

Vir nov. gen.

Type: *Palaemonella orientalis* Dana

orientalis (Dana, 1852). Synonym: *Palaemonella orientalis* Dana, 1852. Distribution: Andaman Islands, Sulu Sea, Amboina, Hawaiian Archipelago. Vid. p. 30.

Periclimenes Costa, 1844a

Subgenus *Periclimenes* Costa, 1844a

Synonyms: *Pelias* Roux, 1831 (non Merrem, 1820); *Anchistia* Dana, 1852; *Urocaris* Stimpson, 1860; *Dennisia* Norman, 1861; *Corniger* Borradaile, 1915 (non Agassiz, 1831); *Cristiger* Borradaile, 1915 (non Gistl, 1848); *Laomenes* Clark, 1919.

Type: *Periclimenes insignis* Costa

aesopius (Bate, 1863). Synonyms: *Anchistia aesopia* Bate, 1863; *Urocaris aesopius* Borradaile, 1917a. Distribution: Ceylon, Moluccas, Lesser Sunda Islands, S. Australia. Vid. p. 34.

alcocki Kemp, 1922. Distribution: Laccadive Sea, Japan. Depth 300-730 m.

amethysteus (Risso, 1826). Synonyms: *Alpheus amethystea* Risso, 1826; *Pelias amethysteus* Roux, 1831; *Periclimenes insignis* Costa, 1844a; *Dennisia sagittifera* Norman, 1861; *Anchistia amethystea* Heller, 1863; *Periclimenes* (*Falciger*) *amethysteus* Borradaile, 1917a. Distribution: Eastern Atlantic Ocean from the Channel Islands to the Western Mediterranean. Vid. p. 32.

ceratophthalmus Borradaile, 1915. Synonyms: *Periclimenes* (*Corniger*) *ceratophthalmus* Borradaille, 1915; *Periclimenes* (*Laomenes*) *ceratophthalmus* Clark, 1921; *Periclimenes* (*Ancylocaris*) *ceratophthalmus* Kemp, 1922. Distribution: Maldive Archipelago, Moluccas. Vid. p. 56.

commensalis Borradaile, 1915. Synonym: *Periclimenes* (*Cristiger*) *commensalis* Borradaile, 1915. Distribution: Lesser Sunda Islands, Torres Strait. Vid. p. 53.

curvirostris Kubo, 1940. Distribution: Japan. Depth: 300 m.

gracilis (Dana, 1852). Synonyms: *Anchistia gracilis* Dana, 1852; *Periclimenes* (*Cristiger*) *gracilis* Borradaile, 1917a. Distribution: Sulu Sea.

granulatus Holthuis, 1950b. Distribution: Off Algeria. Depth about 100 m.

harringtoni Lebour, 1949. Distribution: Bermuda, Tortugas (Florida).

hertwigi Balss, 1913. Synonym: *Periclimenes* (*Ancylocaris*) *gracilirostris* Kubo, 1940. Distribution: Japan, Kai Islands. Depth 120-300 m. Vid. p. 43.

impar Kemp, 1922. Distribution: Ceylon, Andaman Islands, Lesser Sunda Islands, Aru Islands. Perhaps identical with *P. incertus*. Vid. p. 38.

incertus Borradaile, 1915. Synonym: *Periclimenes* (*Cristiger*) *incertus* Borradaile, 1915. Distribution: Maldive Archipelago. Perhaps *P. impar* is a synonym.

indicus (Kemp, 1915). Synonym: *Urocaris indicus* Kemp, 1915. Distribution: Eastcoast of India, Nicobar Islands, Lesser Sunda Islands. Vid. p. 39.

infraspinis (Rathbun, 1902a). Synonym: *Urocaris infraspina* Rathbun, 1902a. Distribution: Westcoast of America from San Diego (California) to Costa Rica and the Galapagos Islands.

investigatoris Kemp, 1922. Distribution: Persian Gulf.

iridescens Lebour, 1949. Distribution: Bermuda, Venezuela.

laccadivensis (Alcock & Anderson, 1894). Synonyms: *Palaemonella laccadivensis* Alcock & Anderson, 1894; *Palaemon* (*Brachycarpus*) *laccadivensis* Alcock, 1901. Distribution: Laccadive Sea: depth 770-1265 m. Hawaiian Islands: depth 700-900 m. [1]).

lanipes Kemp, 1922. Distribution: Mergui Archipelago.

latipollex Kemp, 1922. Distribution: Mergui Archipelago, Kai Islands. Depth 112-304 m. Vid. p. 47.

longicaudatus (Stimpson, 1860). Synonym: *Urocaris longicaudatus* Stimpson, 1860. Distribution: Eastcoast of America from North Carolina to Brazil, West Indies.

noverca Kemp, 1922. Distribution: New Caledonia.

obscurus Kemp, 1922. Distribution: Madras.

pandionis Holthuis, 1951a. Distribution: Off Key West, Fla. Depth 180 m.

parvus Borradaile, 1898a. Synonym: *Periclimenes* (*Cristiger*) *parvus* Borradaile, 1917a. Distribution: Makassar Strait, New Britain. Vid. p. 40.

pectiniferus nov. spec. Distribution: Makassar Strait. Vid. p. 48.

perryae Chace, 1942. Distribution: W. Florida.

rex Kemp, 1922. Distribution: Andaman Islands.

scriptus (Risso, 1822). Synonyms: *Alpheus scriptus* Risso, 1822; *Pelias Scriptus* Roux, 1831; *Anchistia scripta* Heller, 1863; ? *Periclimenes elegans* Gourret, 1884 (non Paulson, 1875); *Urocaris de Mani* Balss, 1916; *Periclimenes* (*Cristiger*) *scriptus* Borradaile, 1917a. Distribution: Eastern Atlantic Ocean from the Mediterranean to the French Congo.

signatus Kemp, 1925. Distribution: Andaman Islands.

soror Nobili, 1904. Synonyms: *Periclimenes* (*Cristiger*) *soror* Borradaile, 1917a; *Periclimenes bicolor* Edmondson, 1935. Distribution: Jibuti, Lesser Sunda Islands, Hawaiian Archipelago. Perhaps *P.* (*Harpilius*) *frater* Borradaile is identical with this species. Vid. p. 51.

tenellus (Smith, 1882). Synonyms: *Anchistia tenella* Smith, 1882; *Periclimenes* (*Cristiger*) *tenellus* Borradaile, 1917; *Periclimenes* (*Ancylocaris*) *tenellus* Kemp, 1922. Distribution: Off Massachusetts and off South Carolina, U.S.A. Depth 260 to 410 m.

yucatanicus (Ives, 1891). Synonym: *Palaemonella yucatanica* Ives, 1891. Distribution: S. Florida, and the Atlantic coast of Mexico and Colombia.

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1) Examination of the specimens brought by Rathbun (1906) to "*Palaemonella*" *laccadivensis* showed that the specimen from Kauai Island indeed belongs to *Periclimenes laccadivensis*, the other specimen from Laysan, however, probably belongs to a new species of *Periclimenes*, near *P. diversipes*.

Subgenus **Harpilius** Dana, 1852

Synonyms: *Ancylocaris* Schenkel, 1902; *Falciger* Borradaile, 1915 (non Say, 1824); *Ancyclocaris* Borradaile, 1917a (err. pro *Ancylocaris*); *Cuapetes* Clark, 1919.

Type: *Harpilius lutescens* Dana

affinis Borradaile, 1915. Synonyms: *Periclimenes* (*Falciger*) *affinis* Borradaile, 1915; *Periclimenes* (*Ancylocaris*) *affinis* Kemp, 1922. Distribution: Chagos Archipelago.

agag Kemp, 1922. Synonym: *Periclimenes* (*Ancylocaris*) *agag* Kemp, 1922. Distribution: Andaman Islands.

akiensis Kubo, 1936. Synonym: *Periclimenes* (*Ancylocaris*) *akiensis* Kubo, 1936. Distribution: Japan.

amamiensis Kubo, 1940. Synonym: *Periclimenes* (*Ancylocaris*) *amamiensis* Kubo, 1940. Distribution: Riukiu Islands.

amboinensis (De Man, 1888). Synonyms: *Anchistia amboinensis* De Man, 1888; *Periclimenes* (*Corniger*) *amboinensis* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *amboinensis* Kemp, 1922. Distribution: Amboina. Vid. p. 60.

americanus (Kingsley, 1878). Synonyms: *Anchistia americana* Kingsley, 1878; *Palaemonella tenuipes* Heilprin, 1888 (non Dana, 1852); *Periclimenes* (*Falciger*) *americanus* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *americanus* Kemp, 1922; *Periclimenes* (*Ancylocaris*) *bermudensis* Lebour, 1949; *Periclimenes* (*Ancylocaris*) *rhizophorae* Lebour, 1949a. Distribution: American Eastcoast from Bermuda and Florida to the West Indies. Vid. p. 57.

amymone De Man, 1902. Synonym: *Periclimenes* (*Falciger*) *amymone* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *amymone* Kemp, 1922. Distribution: Nicobar Islands, Malay Archipelago, Samoa. Vid. p. 82.

andamanensis Kemp, 1922. Synonym: *Periclimenes* (*Ancylocaris*) *andamanensis* Kemp, 1922. Distribution: Andaman Islands, Sunda Strait. Vid. p. 79.

batei Holthuis, 1950a. Synonyms: *Brachycarpus audouini* Bate, 1888; *Palaemon audouini* Ortmann, 1891 (non Heller, 1862); *Periclimenes* (*Ancylocaris*) *audouini* Kemp, 1925. Distribution: Off New Zealand. Vid. p. 73.

brevicarpalis (Schenkel, 1902). Synonyms: *Palaemonella amboinensis* Zehntner, 1894 (non *Periclimenes amboinensis* (De Man, 1888)); *Ancylocaris brevicarpalis* Schenkel, 1902; *Palaemonella aberrans* Nobili, 1904; *Harpilius latirostris* Lenz, 1905; *Periclimenes potina* Nobili, 1905; *Ancylocaris aberrans* Nobili, 1906; *Periclimenes hermitensis* Rathbun, 1914; *Ancyclocaris brevicarpalis* Borradaile, 1917a; *Ancyclocaris aberrans* Borradaile, 1917a; *Ancyclocaris latirostris* Borradaile, 1917a; *Ancyclocaris hermitensis* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *potina* Kemp, 1922; *Periclimenes* (*Ancylocaris*) *brevicarpalis* Kemp, 1922. Distribution: Throughout the Indo-Westpacific region, from the Red Sea and S.E. Africa to the Riukiu Islands, the Malay Archipelago and Oceania. Vid. p. 69.

brocketti Borradaile, 1915. Synonyms: *Periclimenes* (*Falciger*) *brocketti* Borradaile, 1915; *Periclimenes* (*Cuapetes*) *brocketti* Clark, 1921; *Periclimenes* (*Ancylocaris*) *brocketti* Kemp, 1922. Distribution: Maldive Archipelago.

brocki (De Man, 1888). Synonyms: *Anchistia Brockii* De Man, 1888; *Periclimenes* (*Cristiger*) *brocki* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *brocki* Kemp, 1922. Distribution: Maldive Archipelago, Moluccas. Vid. p. 88.

calmani Tattersall, 1921. Synonym: *Periclimenes* (*Ancylocaris*) *calmani* Kemp, 1922. Distribution: Suez Canal, Red Sea, ? Flores Sea. Vid. p. 64.

compressus Borradaile, 1915. Synonyms: *Periclimenes* (*Falciger*) *compressus* Borradaile, 1915; *Periclimenes* (*Ancylocaris*) *compressus* Kemp, 1922. Distribution: Saya de Malha Bank (Western Indian Ocean).

cornutus Borradaile, 1915. Synonyms: *Periclimenes* (*Corniger*) *cornutus* Borradaile, 1915; *Periclimenes* (*Laomenes*) *cornutus* Clark, 1921; *Periclimenes* (*Ancylocaris*) *cornutus* Kemp, 1922. Distribution: Maldive Archipelago.

demani Kemp, 1915. Synonym: *Periclimenes* (*Ancylocaris*) *demani* Kemp, 1922. Distribution: East-coast of India, Mergui Archipelago. Vid. p. 83.

denticulatus Nobili, 1906a. Synonyms: *Periclimenes Petitthouarsi* var. *denticulata* Nobili, 1906a. *Periclimenes* (*Falciger*) *denticulatus* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *denticulatus* Kemp, 1922. Distribution: Gatavake (Oceania).

digitalis Kemp, 1922. Synonym: *Periclimenes* (*Ancylocaris*) *digitalis* Kemp, 1922. Distribution: Andaman Islands, Flores Sea. Vid. p. 87.

diversipes Kemp, 1922. Synonym: *Periclimenes* (*Ancylocaris*) *diversipes* Kemp, 1922. Distribution: Red Sea, Bay of Bengal.

edwardsi (Paulson, 1875). Synonyms: *Anchistia edwardsi* Paulson, 1875; *Periclimenes* (*Falciger*) *edwardsi* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *edwardsi* Kemp, 1922. Distribution: Red Sea.

elegans (Paulson, 1875). Synonyms: *Anchistia elegans* Paulson, 1875; *Periclimenes* (*Falciger*) *dubius* Borradaile, 1917a; *Periclimenes* (*Falciger*) *elegans* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *elegans* Kemp, 1922; *Periclimenes* (*Ancylocaris*) *elegans* var. *dubius* Kemp, 1922. Distribution: Red Sea, Persian Gulf, Minikoi, Bay of Bengal, Malay Archipelago, Queensland. Vid. p. 81.

ensifrons (Dana, 1852). Synonyms: *Anchistia ensifrons* Dana, 1852; *Periclimenes* (*Falciger*) *ensifrons* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *ensifrons* Kemp, 1922. Distribution: N. Borneo, Tuamotu Islands. (Vid. also p. 67).

frater Borradaile, 1915. Synonyms: *Periclimenes* (*Cristiger*) *frater* Borradaile, 1915; *Periclimenes* (*Ancylocaris*) *frater* Kemp, 1922. Distribution: Seychelles. Probably identical with *Periclimenes* (*P.*) *soror* Nobili. Vid. p. 52.

galene nov. spec. Distribution: Malay Archipelago. Vid. p. 62.

grandis (Stimpson, 1860). Synonyms: *Anchistia grandis* Stimpson, 1860; *Periclimenes* (*Falciger*) *grandis* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *grandis* Kemp, 1922. Distribution: Indo-Westpacific region from the Red Sea and Zanzibar to Japan and the Malay Archipelago. Vid. p. 79.

inornatus Kemp, 1922. Synonym: *Periclimenes* (*Ancylocaris*) *inornatus* Kemp, 1922. Distribution: Andaman Islands.

jugalis nov. spec. Distribution: Aru Islands. Vid. p. 67.

korni (Lo Bianco, 1903). Synonyms: *Anchistia Kornii* Lo Bianco, 1903; *Urocaris korni* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *korni* Kemp, 1922. Distribution: ? Bay of Biscay, off Capri. Depth (740-)1080 m.

leptopus Kemp, 1922. Synonym: *Periclimenes* (*Ancylocaris*) *leptopus* Kemp, 1922. Distribution: Andaman Islands. Vid. p. 64.

longimanus (Dana, 1852). Synonyms: *Anchistia longimana* Dana, 1852; *Periclimenes* (*Falciger*) *longimanus* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *longimanus* Kemp, 1922. Distribution: Unknown.

longipes (Stimpson, 1860). Synonyms: *Urocaris longipes* Stimpson, 1860; *Periclimenes* (*Ancylocaris*) *longipes* Kemp, 1922. Distribution: Japan.

lucasi Chace, 1937. Synonym: *Periclimenes* (*Ancylocaris*) *lucasi* Chace, 1937. Distribution: Lower California to Panama.

lutescens (Dana, 1852). Synonyms: *Harpilius lutescens* Dana, 1852; *Harpilius consobrinus* De Man, 1902. Distribution: Red Sea, Malay Archipelago, Tongatabu. Vid. p. 88.

magnus Holthuis, 1951a. Distribution: Gulf of Mexico (off Texas).

nilandensis Borradaile, 1915. Synonyms: *Periclimenes* (*Falciger*) *nilandensis* Borradaile, 1915; *Periclimenes* (*Ancylocaris*) *nilandensis* Kemp, 1922. Distribution: Maldive Archipelago, Malay Archipelago. Vid. p. 58.

pauper Holthuis, 1951a. Distribution: Off Venezuela.

petitthouarsi (Audouin, 1825). Synonyms: *Palaemon Petitthouarsii* Audouin, 1825; *Anchistia inaequimana* Heller, 1861; *Anchistia Petitthouarsii* Paulson, 1875; *Periclimenes* (*Falciger*) *petitthouarsi* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *petitthouarsi* Kemp, 1922. Distribution: Red Sea, Persian Gulf. Vid. p. 78.

platalea Holthuis, 1951. Distribution: Cape Verde Islands, French Guinea.

platycheles nov. spec. Distribution: Moluccas, W. New Guinea. Vid. p. 85.

proximus Kemp, 1922. Synonym: *Periclimenes* (*Ancylocaris*) *proximus* Kemp, 1922. Distribution: Andaman Islands, Papua [1]).

psamathe (De Man, 1902). Synonyms: *Urocaris psamathe* De Man, 1902; *Periclimenes* (*Ancylocaris*) *psamathe* Kemp, 1922. Distribution: Maldive Archipelago, Chagos Archipelago, Moluccas. Vid. p. 61.

rathbunae Schmitt, 1924a. Distribution: Bonaire, Curaçao.

rotumanus Borradaile, 1898a. Synonyms: *Periclimenes* (*Falciger*) *rotumanus* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *rotumanus* Kemp, 1922. Distribution: Rotuma, Samoa [1]).

seychellensis Borradaile, 1915. Synonyms: *Periclimenes* (*Falciger*) *seychellensis* Borradaile, 1915; *Periclimenes* (*Ancylocaris*) *seychellensis* Kemp, 1922. Distribution: Red Sea, Seychelles, Bay of Bengal, Malay Archipelago, Papua. Vid. p. 66.

sibogae nov. spec. Distribution: Moluccas. Vid. p. 73.

spiniferus De Man, 1902. Synonyms: *Periclimenes petitthouarsi* var. *spinifera* De Man, 1902; *Periclimenes* (*Falciger*) *spiniferus* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *spiniferus* Kemp, 1922. Distribution: Indo-Westpacific region from the Seychelles and Madagascar to the Malay Archipelago, Queensland and Oceania. Vid. p. 76.

suvadivensis Borradaile, 1915. Synonyms: *Periclimenes* (*Falciger*) *suvadivensis* Borradaile, 1915; *Periclimenes* (*Ancylocaris*) *suvadivensis* Kemp, 1922. Distribution: Maldive Archipelago.

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1) The specimen from Beagle Bay, S. E. Papua, identified by Nobili (1899) as *Periclimenes rotumanus*, has been examined by me in the Museo Civico di Storia Naturale in Genoa, Italy. It proved to belong to *Periclimenes proximus*.

tenuipes Borradaile, 1898a. Synonyms: *Periclimenes borradailei* Rathbun, 1904; *Periclimenes* (*Falciger*) *kolumadulensis* Borradaile, 1915; *Periclimenes* (*Falciger*) *borradailei* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *tenuipes* Kemp, 1922. Distribution: Seychelles, Maldive Archipelago, Bay of Bengal, Malay Archipelago, New Britain. Vid. p. 84.

veleronis Holthuis, 1951a. Distribution: Ecuador.

vitiensis Borradaile, 1989a. Synonyms: *Periclimenes* (*Falciger*) *vitiensis* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *vitiensis* Kemp, 1922. Distribution: Fiji. (Vid. also p. 26).

Paranchistus nov. gen.

Type: *Anchistus biunguiculatus* Borradaile

biunguiculatus (Borradaile, 1898a). Synonym: *Anchistus biunguiculatus* Borradaile, 1898a; *Tridacnocaris biunguiculata* Nobili, 1899; *Anchistus oshimai* Kubo, 1949a. Distribution: Moluccas, New Guinea, Palau Islands. Vid. p. 93.

nobilii nov. spec. Distribution: Persian Gulf. Vid. p. 100.

ornatus nov. spec. Distribution: Mozambique. Vid. p. 97.

Anchistus Borradaile, 1898a

Synonyms: *Tridacnocaris* Nobili, 1899; *Marygrande* Pesta, 1911; *Ensiger* Borradaile, 1915.

Type: *Harpilius Miersi* De Man

custos (Forsskål, 1775). Synonyms: *Cancer custos* Forsskål, 1775; *Palaemon custos* Latreille, 1802; *Pontonia inflata* H. Milne Edwards, 1840; *Anchistia aurantiaca* Dana, 1852; *Harpilius inermis* Miers, 1884; *Pontonia pinnae* Ortmann, 1894 (non Lockington, 1878); *Anchistus inermis* Borradaile, 1898a; *Periclimenes* (*Ensiger*) *aurantiacus* Borradaile, 1917a. Distribution: Indo-Westpacific region from the Red Sea and the East African coast to the Malay Archipelago, S. Australia and Oceania. Vid. p. 105.

demani Kemp, 1922. Distribution: Andaman Islands.

gravieri Kemp, 1922. Distribution: Santa Cruz Islands (Oceania).

miersi (De Man, 1888a). Synonym: *Harpilius Miersi* De Man, 1888a. Distribution: From the Red Sea and the Seychelles to Indo-China and Oceania. Vid. p. 110.

misakiensis Yokoya, 1936. Distribution: Japan.

pectinis Kemp, 1925. Distribution: Nicobar Islands.

Thaumastocaris Kemp, 1922

Type: *Thaumastocaris streptopus* Kemp

streptopus Kemp, 1922. Distribution: Malay Archipelago, New Caledonia. Vid. p. 111.

Periclimenaeus Borradaile, 1915

Synonym: *Hamiger* Borradaile, 1916.

Type: *Periclimenaeus robustus* Borradaile

arabicus (Calman, 1939). Synonym: *Periclimenes* (*Periclimenaeus*) *arabicus* Calman, 1939. Distribution: South Arabian coast. Vid. p. 130.

arthrodactylus nov. spec. Distribution: Bali Sea. Vid. p. 122.

ascidiarum Holthuis, 1951a. Distribution: Tortugas (Fla.) and Atlantic coast of Colombia.

atlanticus (Rathbun, 1902). Synonyms: *Coralliocaris atlantica* Rathbun, 1902; *Periclimenes atlantica* Schmitt, 1935. Distribution: Virgin Islands.

bermudensis (Armstrong, 1940). Synonym: *Periclimenes* (*Periclimenaeus*) *bermudensis* Armstrong, 1940. Distribution: Bermudas, Bahamas, Florida.

bouvieri (Nobili, 1904). Synonym: *Typton Bouvieri* Nobili, 1904. Distribution: Red Sea. Vid. p. 131.

caraibicus Holthuis, 1951a. Distribution: Tobago (British West Indies).

fimbriatus Borradaile, 1915. Synonym: *Periclimenes* (*Periclimenaeus*) *fimbriatus* Kemp, 1922. Distribution: Maldive Archipelago. Depth 70 and 90 m. Vid. p. 131.

gorgonidarum (Balss, 1913). Synonym: *Periclimenes gorgonidarum* Balss, 1913. Distribution: Japan. Vid. p. 129.

hancocki Holthuis, 1951a. Distribution: Westcoast of Panama.

maxillulidens (Schmitt, 1936). Synonym: *Periclimenes maxillulidens* Schmitt, 1936. Distribution: Florida, West Indies.

minutus nov. spec. Distribution: Moluccas. Vid. p. 134.

natalensis (Stebbing, 1915). Synonyms: *Palaemonetes natalensis* Stebbing, 1915; *Periclimenes natalensis* Kemp, 1925. Distribution: Natal coast. Depth 800 m. Vid. p. 130.

novae-zealandiae (Borradaile, 1916). Synonyms: *Periclimenes* (*Hamiger*) *novae-zealandiae* Borradaile, 1916; *Periclimenes* (*Periclimenaeus*) *novae-zealandiae* Kemp, 1922. Distribution: New Zealand. Depth 128 m. Vid. p. 130.

pacificus Holthuis, 1951a. Distribution: Westcoast of Panama and Colombia, Galapagos Islands.

pearsei (Schmitt, 1932). Synonym: *Coralliocaris pearsei* Schmitt, 1932. Distribution: Tortugas (Fla.).

perlatus (Boone, 1930). Synonym: *Corallocaris perlatus* Boone, 1930. Distribution: Tortugas (Fla), Haiti, Eastcoast of Panama.

rhodope (Nobili, 1904). Synonym: *Coralliocaris* (*Onycocaris*) *rhodope* Nobili, 1904. Distribution: Red Sea, Persian Gulf, Moluccas. Vid. p. 125.

robustus Borradaile, 1915. Synonym: *Periclimenes* (*Periclimenaeus*) *robustus* Kemp, 1922. Distribution: Amirante Islands. Vid. p. 131.

schmitti Holthuis, 1951a. Distribution: Tortugas (Fla.).

spinosus Holthuis, 1951a. Distribution: Pacific coast of Costa Rica.

spongicola nov. spec. Distribution: Java Sea. Vid. p. 137.

tridentatus (Miers, 1884). Synonyms: *Coralliocaris tridentata* Miers, 1884; *Coralliocaris hecate* Nobili, 1904; *Coralliocaris quadridentata* Rathbun, 1906; *Coralliocaris rathbuni* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *crassipes* Calman, 1939. Distribution: Red Sea, S. Arabian coast, Malay Archipelago, N. Australia, Oceania. Vid. p. 140.

truncatus (Rathbun, 1906). Synonym: *Coralliocaris truncata* Rathbun, 1906. Distribution: Malay Archipelago, Hawaiian Archipelago. Depth 41-90 m. Vid. p. 117.

wilsoni (Hay, 1917). Synonym: *Coralliocaris wilsoni* Hay, 1917. Distribution: North Carolina, Tortugas (Fla.).

Onycocaris Nobili, 1904

Type: *Coralliocaris* (*Onycocaris*) *aualitica* Nobili

aualitica (Nobili, 1904). Synonym: *Coralliocaris* (*Onycocaris*) *aualitica* Nobili, 1904. Distribution: Red Sea. Vid. p. 147.

quadratophthalma (Balss, 1921). Synonym: *Pontonia quadratophthalma* Balss, 1921. Distribution: N.W. Australia, Oceania. Vid. p. 150.
stenolepis nov. spec. Distribution: Sulu Archipelago. Vid. p. 148.

Philarius nov. gen.

Type: *Harpilius gerlachei* Nobili
gerlachei (Nobili, 1905). Synonym: *Harpilius gerlachei* Nobili, 1905. Distribution: Red Sea, South-coast of Arabia, Persian Gulf, Gulf of Manaar, Malay Archipelago, Samoa. Vid. p. 152.
imperialis (Kubo, 1940a). Synonym: *Harpilius imperialis* Kubo, 1940a. Distribution: Bonin Islands.

Pontoniopsis Borradaile, 1915

Type: *Pontoniopsis comanthi* Borradaile
comanthi Borradaile, 1915. Distribution: Lesser Sunda Islands, Torres Strait. Vid. p. 153.

Pontonia Latreille, 1829

Synonym: *Alciope* Rafinesque, 1814.
Type: *Palaemon pinnophylax* Otto
anachoreta Kemp, 1922. Distribution: Gulf of Aden, off the Madras coast.
ascidicola Borradaile, 1898a. Distribution: S.E. Celebes, New Britain. Vid. p. 165.
brevirostris Miers, 1884. Distribution: Seychelles.
californiensis Rathbun, 1902. Distribution: Channel Islands off California.
chimaera Holthuis, 1951a. Distribution: Pearl Islands (off W. Panama).
domestica Gibbes, 1848. Synonyms: *Pontonia occidentalis* Gibbes, 1848 (nom. nud.); *Conchodytes domestica* Rathbun, 1902. Distribution: Madeira, Bahamas and Atlantic coast of the U.S.A. from S. Carolina to Louisiana.
flavomaculata Heller, 1864. Synonyms: *Alciope heterochelus* Rafinesque, 1814; *Pontonia phallusiae* Marion, 1879; *Pontonia diazona* Joliet, 1882. Distribution: Adriatic, Western Mediterranean, Westcoast of Morocco, French Guinea.
katoi Kubo, 1940. Distribution: Japan, Moluccas, Lesser Sunda Islands. Vid. p. 158.
longispina Holthuis, 1951a. Distribution: Gulf of California.
margarita Smith, in Verrill, 1869. Synonyms: *Coralliocaris Camerani* Nobili, 1901; *Conchodytes margarita* Rathbun, 1904. Distribution: Westcoast of America from Lower California to Colombia and the Galapagos Islands; Florida.
medipacifica Edmondson, 1935. Distribution: Midway Island (Pacific Ocean).
mexicana Guérin, 1856. Synonym: *Pontonia grayi* Rathbun, 1902. Distribution: Bahamas, West Indies, Atlantic coast of Mexico.
minuta Baker, 1907. Distribution: South Australia
miserabilis Holthuis, 1951a. Distribution: Porto Rico (West Indies).
okai Kemp, 1922. Distribution: Burma coast, Lesser Sunda Islands. Vid. p. 164.
pinnae Lockington, 1878. Distribution: Westcoast of America from the Gulf of California to Panama.
pinnophylax (Otto, 1821). Synonyms: *Alpheus Tyrhenus* Risso, 1816 (non *Astacus tyrrhenus* Petagna, 1792); *Palaemon pinnophylax* Otto, 1821; *Gnathophyllum tyrhenus* Desmarest, 1823; *Cal-*

lianassa tyrrhena Risso, 1826; *Alpheus pinnophylax* Otto, 1828; *Pontonia parasitica* Roux, 1831; *Pontonia custos* Guérin, 1832 (non *Cancer custos* Forsskål, 1775); *Pontonia heterochelis* Guérin, 1832. Distribution: Mediterranean from the eastcoast of Spain to Greece, Açores, Gabon, N. Angola. Vid. p. 156.

pusilla Holthuis, 1951a. Distribution: Pacific coast of Panama and Ecuador.

simplex Holthuis, 1951a. Distribution: Pacific coast of Mexico.

stylirostris nov. spec. Distribution: Moluccas. Vid. p. 169.

Platycaris nov. gen.

Type: *Platycaris latirostris* nov. spec.

latirostris nov. spec. Distribution: Flores (Lesser Sunda Islands). Vid. p. 173.

Dasycaris Kemp, 1922

Type: *Dasycaris symbiotes* Kemp

ceratops nov. spec. Distribution: Borneo Bank. Vid. p. 176.

symbiotes Kemp, 1922. Distribution: Madras coast, Mergui Archipelago.

Harpiliopsis Borradaile, 1915

Type: *Palaemon Beaupresii* Audouin

beaupresi (Audouin, 1825). Synonyms: *Palaemon Beaupresii* Audouin, 1825; *Harpilius Beaupresii* Heller, 1861; *Pontonia* (*Harpilius*) *dentata* Richters, 1880. Distribution: Indo-Westpacific region from the Red Sea and S.E. Africa to the Malay and Hawaiian Archipelagoes. Vid. p. 181.

depressus (Stimpson, 1860). Synonyms: *Harpilius depressus* Stimpson, 1860; *Periclimenes spinigerus* Borradaile, 1898a (non *Anchistia spinigera* Ortmann, 1890). Distribution: Indo-Westpacific region from the Red Sea and S.E. Africa to the Malay Archipelago and Oceania; Eastpacific region from the Gulf of California to Colombia and the Galapagos Islands. Vid. p. 182.

depressus var. *spinigerus* (Ortmann, 1890). Synonyms: *Anchistia spinigera* Ortmann, 1890; *Harpilius depressus* var. *gracilis* Kemp, 1922. Distribution: Andaman Islands, Celebes, Samoa. Vid. p. 184.

Stegopontonia Nobili, 1906a

Type: *Stegopontonia commensalis* Nobili

commensalis Nobili, 1906a. Distribution: Mauritius, Tuamotu Islands [1]).

Fennera Holthuis, 1951a

Type: *Fennera chacei* Holthuis

chacei Holthuis, 1951a. Distribution: Westcoast of America from Mexico to Colombia.

Coralliocaris Stimpson, 1860

Synonym: *Oedipus* Dana, 1852 (non Berthold, 1827).

1) The Mauritius record of this species is given by Mortensen (1940, pp. 250, 294).

Type: *Oedipus superbus* Dana

brevirostris Borradaile, 1898a. Distribution: Ellice Islands.

graminea (Dana, 1852). Synonyms: *Oedipus gramineus* Dana, 1852; *Coralliocaris inaequalis* Ortmann, 1890. Distribution: Throughout the Indo-Westpacific region from the Red Sea and the East African Coast to China, Australia and Oceania. Vid. p. 186.

macrophthalma (H. Milne Edwards, 1837). Synonyms: *Pontonia macrophthalma* H. Milne Edwards, 1837; *Oedipus macrophthalmus* Dana, 1852. Distribution: Red Sea, Seychelles.

nudirostris (Heller, 1861).Synonyms: *Oedipus nudirostris* Heller, 1861; *Coralliocaris tahitoei* Boone, 1935. Distribution: Red Sea, Seychelles, Maldive Archipelago, Tahiti. (Vid. also p. 110).

superba (Dana, 1852). Synonyms: *Oedipus superbus* Dana, 1852; *Oedipus dentirostris* Paulson, 1875. Distribution: Red Sea, Andaman and Nicobar Islands, Bonin Islands, Malay Archipelago, ? Christmas Island, Oceania. Vid. p. 189.

venusta Kemp, 1922. Distribution: Red Sea, Ceylon, Malay Archipelago, Samoa. Vid. p. 191.

Jocaste nov. gen.

Type: *Coralliocaris lucina* Nobili

lucina (Nobili, 1901a). Synonyms: ? *Coralliocaris lamellirostris* Stimpson, 1860; ? *Coralliocaris superba* var. *japonica* Ortmann, 1890; *Coralliocaris lucina* Nobili, 1901a; *Coralliocaris japonica* Borradaile, 1917a. Distribution: Throughout the Indo-Westpacific region from the Red Sea and S.E. Africa to the Malay Archipelago and Samoa, probably northwards to Japan. Vid. p. 193.

Conchodytes Peters, 1852

Type: *Conchodytes tridacnae* Peters

biunguiculatus (Paulson, 1875). Synonym: *Pontonia biunguiculata* Paulson, 1875. Distribution: Red Sea, ? S. India, Andaman Islands, Formosa, Moluccas, Lesser Sunda Islands, ? Queensland. Vid. p. 199.

monodactylus nov. spec. Distribution: Formosa, Lesser Sunda Islands. Vid. p. 200.

nipponensis (De Haan, 1844). Synonyms: *Hymenocera nipponensis* De Haan, 1844; *Pontonia nipponensis* De Haan, 1849. Distribution: Japan.

tridacnae Peters, 1852. Synonyms: *Conchodytes meleagrinae* Peters, 1852; *Pontonia Tridacnae* Dana, 1852; *Pontonia meleagrinae* Bate, 1888. Distribution: Throughout the Indo-Westpacific region from the Red Sea and the East African coast to the Malay Archipelago, Australia and Oceania. Vid. p. 195.

Dasella Lebour, 1945

Synonym: *Dasia* Lebour, 1938 (non Gray, 1839).

Type: *Dasia herdmaniae* Lebour

herdmaniae (Lebour, 1938). Synonyms: *Dasia herdmaniae* Lebour, 1938; *Dasella herdmanniae* Lebour, 1945. Distribution: S. India.

Cavicheles nov. gen.

Type: *Cavicheles kempi* nov. spec.

kempi nov. spec. Distribution: Moluccas. Vid. p. 205.

Hamodactylus nov. gen.

Type: *Hamodactylus boschmai* nov. spec.

boschmai nov. spec. Distribution: Ternate, Aru Islands. Vid. p. 209.

Waldola Holthuis, 1951a

Type: *Waldola schmitti* Holthuis

schmitti Holthuis, 1951a. Distribution: Westcoast of America from Mexico to Colombia.

Anchistioides Paulson, 1875

Synonyms: *Palaemonopsis* Borradaile, 1899 (non Stimpson, 1874); *Amphipalaemon* Nobili, 1901.

Type: *Anchistioides compressus* Paulson

antiguensis (Schmitt, 1924b). Synonyms: *Periclimenes antiguensis* Schmitt, 1924b; *Periclimenes barbadensis* Schmitt, 1924b. Distribution: Bermuda, West Indies.

compressus Paulson, 1875. Distribution: Red Sea, Andaman Islands.

seurati (Nobili, 1906a). Synonym: *Amphipalaemon Seurati* Nobili, 1906a. Distribution: Tuamotu Islands.

willeyi (Borradaile, 1899). Synonyms: *Palaemonopsis willeyi* Borradaile, 1899; *Amphipalaemon willeyi* Nobili, 1901; *Amphipalaemon gardineri* Borradaile, 1915; *Amphipalaemon cooperi* Borradaile, 1915; *Amphipalaemon australiensis* Balss, 1921; *Anchistioides gardineri* Gordon, 1935; *Anchistioides cooperi* Gordon, 1935; *Anchistioides australiensis* Gordon, 1935. Distribution: Maldive Archipelago, Malay Archipelago, N.W. Australia, New Britain. Vid. p. 214.

Pontonides Borradaile, 1917a

Type: *Pontonia maldivensis* Borradaile

maldivensis (Borradaile, 1915). Synonym: *Pontonia maldivensis* Borradaile, 1915. Distribution: Maldive Archipelago.

unciger Calman, 1939. Distribution: Red Sea, Lesser Sunda Islands. Vid. p. 219.

Neopontonides Holthuis, 1951a

Type: *Periclimenes beaufortensis* Borradaile

beaufortensis (Borradaile, 1920). Synonyms: *Periclimenes beaufortensis* Borradaile, 1920; *Pontonides beaufortensis* Kemp, 1922. Distribution: Eastcoast of America from North Carolina to Panama, West Indies.

dentiger Holthuis, 1951a. Distribution: Pacific coast of Ecuador.

Veleronia Holthuis, 1951a

Type: *Veleronia serratifrons* Holthuis

laevifrons Holthuis, 1951a. Distribution: Ecuador, Galapagos Islands.

serratifrons Holthuis, 1951a. Distribution: Ecuador, Galapagos Islands.

Balssia Kemp, 1922

Type: *Amphipalaemon gasti* Balss

gasti (Balss, 1921a). Synonym: *Amphipalaemon gasti* Balss, 1921a. Distribution: Western Mediterranean, French Guinea.

Coutièrea Nobili, 1901b

Type: *Coralliocaris Agassizi* Coutière

agassizi (Coutière, 1901a). Synonym: *Coralliocaris Agassizi* Coutière, 1901a. Distribution: Barbados. Depth 170 m.

Pseudocoutièrea Holthuis, 1951a

Type: *Pseudocoutièrea elegans* Holthuis

elegans Holthuis, 1951a. Distribution: Westcoast of America from S. California to Mexico and the Galapagos Islands.

Typton Costa, 1844a

Synonym: *Pontonella* Heller, 1856.

Type: *Typton spongicola* Costa

carneus Holthuis, 1951a. Distribution: Florida, Cuba.

gnathophylloides Holthuis, 1951a. Distribution: Tortugas (Fla.).

hephaestus Holthuis, 1951a. Distribution: Gulf of California.

prionurus Holthuis, 1951a. Distribution: Tortugas (Fla.).

serratus Holthuis, 1951a. Distribution: Pacific coast of Mexico, Galapagos Islands.

spongicola Costa, 1844a. Synonyms: *Pontonia pulsatrix* Nardo, 1847; *Pontonella glabra* Heller, 1856; *Typton spongiosus* Bate, 1868; ? *Pontonia Vagans* Gourret, 1888. Distribution: From the southcoast of England southwards into the Mediterranean up to the Sea of Marmara, Cape Verde Islands, French Guinea, Sierra Leone.

tortugae McClendon, 1910. Distribution: Bermuda, Florida, Gulf of California.

vulcanus Holthuis, 1951a. Distribution: Tortugas (Fla.), Atlantic coast of Colombia.

Paratypton Balss, 1914a

Type: *Paratypton siebenrocki* Balss

siebenrocki Balss, 1914a. Distribution: Red Sea, Marshall Islands, Samoa.

Species incertae:

Anchistia brachiata Stimpson, 1860. Synonyms: *Periclimenes brachiatus* Borradaile, 1898a; *Periclimenes* (*Falciger*) *brachiatus* Borradaile, 1917a. Distribution: Bonin Islands. Stimpson's description is insufficient for identification.

Anchistia Danae Stimpson, 1860. Synonyms: *Periclimenes Danae* Borradaile, 1898a; *Periclimenes* (*Falciger*) *danae* Borradaile, 1917a. Distribution: Tahiti, Funafuti. The identity of both Stimpson's and Borradaile's specimens is not certain, they even may belong to two different species.

Coralliocaris lamellirostris Stimpson, 1860. Distribution: Riukiu Islands. This speciees perhaps is identical with *Jocaste lucina* (Nobili).

Coralliocaris superba var. *japonica* Ortmann (1890). Distribution: Japan. Perhaps identical with *Jocaste lucina* (Nobili).

Harpilius spinuliferus Miers, 1884. Synonym: *Anchistus spinuliferus* Borradaile, 1898a. Distribution: Unknown. The identity of this species, which in all probability belongs to the genus *Anchistus,* cannot be made out from Miers's description.

Marygrande mirabilis Pesta, 1911. Synonym: *Anchistus mirabilis* Borradaile, 1917a. Distribution: Samoa. The specimens described by Pesta (1911) under the name *Marygrande mirabilis* in all probability belong to two different species of *Anchistus.*

Palaemonella affinis Zehntner, 1894. Distribution: Amboina. The species may belong to *Palaemonella* or to *Periclimenes,* the description is too short for identification. Vid. p. 28.

Palaemonella batei Borradaile, 1917a. Distribution: Philippine Islands. Depth 460 m. This species may belong to the genus *Vir,* but as nothing is known about the structure of the mandible, reexamination of the type is necessary to ascertain the real status of the species.

Palaemonella biunguiculata Nobili, 1904. Distribution: Jibuti, ? N.W. Australia. This may be a *Palaemonella,* but in Nobili's description the structure of the mandible is not mentioned.

Pelias Elongatus (Risso, 1826) Hope, 1851. Distribution: Nice, France. *Alpheus Elongatus* Risso, 1826, is a species incerta, which probably is identical with *Hippolyte inermis* Leach, 1815. The species reported upon by Lorenz (1863) as *Pelias elongatus* from the Adriatic may be a species of *Periclimenes.*

Pelias Margaritaceus (Risso, 1816) Hope, 1851. Distribution: Nice, France. *Palemon Margaritaceus* Risso, 1816, is a species incerta, it may be a Hippolytid prawn.

Pelias notatus Heller, 1862a. Synonyms: *Anchistia notata* Heller, 1865; *Periclimenes* (*Cristiger*) *notatus* Borradaile, 1917a. Distribution: Nicobar Islands. Perhaps identical with *Periclimenes lutescens* (Dana).

Periclimenes brevinaris Nobili, 1906. Synonyms: *Periclimenes Borradailei* Nobili, 1905; *Periclimenes* (*Cristiger*) *brevinaris* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *brevinaris* Kemp, 1922. Distribution: Persian Gulf. It is not clear whether this species possesses a hepatic spine or not. In the description this spine is mentioned, but it is absent in the figure. According to Kemp (1922) Nobili's antennal spine is the lower orbital angle, his hepatic spine in reality is the antennal.

Periclimenes elegans Gourret (1884). Distribution: Marseilles. Probably *Periclimenes scriptus* is meant by Gourret; no description is given. Vid. p. 82.

Periclimenes lifuensis Borradaile, 1898a. Synonyms: *Periclimenes* (*Falciger*) *lifuensis* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *lifuensis* Kemp, 1922. Distribution: Loyalty Islands. This species, brought by Borradaile and Kemp to the genus *Periclimenes,* is of such an aberrant type, that in my opinion it can not be retained in that genus. A careful examination of the typespecimen is needed to determine its place among the other Pontoniinae; it may belong to *Periclimenaeus.*

Periclimenes parasiticus Borradaile, 1898a. Synonym: *Periclimenes* (*Cristiger*) *parasiticus* Borradaile, 1917a. Distribution: New Britain. This species shows much resemblance to *Periclimenes soror* Nobili. It has the same size and also is associated with Asteroidea, furthermore many features in both forms are identical. Differences between the two species are:

1. Borradaile (1917a) states that the hepatic spine is wanting in *P. parasiticus,* which also is shown in his (1899) fig. 4a; in his fig. 4b, however, a spine is figured, which is placed a considerable distance from the anterior margin of the carapace; this spine may be the hepatic, as the antennal is placed much more anteriorly.

2. A second difference is the presence of only one anterolateral spine at the basal segment of the antennular peduncle of *P. parasiticus* (vid. Borradaile, 1899, fig. 4b); the presence of 2 or more anterolateral spines, however, may have been overlooked by Borradaile, just as it is done by Nobili in his original description of *P. soror.*

3. The scaphocerite figured by Borradaile for *P. parasiticus* is much more slender than that of *P. soror* figured by Gordon (1939); in his description, however, Borradaile (1899) states: "the scale of the second antenna is broad."

4. The chela of the second pereiopod is much longer in *P. soror* than in *P. parasiticus.*

5. The dactylus of the last three legs are figured more slender in *P. parasiticus,* than in *P. soror,* moreover the dactylus of *P. parasiticus* is figured simple.

Examination of the type of *P. parasiticus* is needed to make certain whether or not the above differences, which for the larger part are obtained by comparing Borradaile's figures with specimens of *P. soror* and with Gordon's description and figures of that species, and which for the larger part are not mentioned in Borradaile's description, actually exist.

The specimen from Beagle Bay, S.E. Papua reported upon by Nobili as *Periclimenes parasiticus,* has been examined by me in the Museo Civico di Storia Naturale in Genoa, Italy, and proved to be a juvenile male of *Leander tenuicornis* (Say), the rostrum of which is slightly abnormal.

Periclimenes pusillus Rathbun, 1906. Synonyms: *Periclimenes* (*Cristiger*) *pusillus* Borradaile, 1917a; *Periclimenes* (*Ancylocaris*) *pusillus* Kemp, 1922. Distribution: Hawaiian Islands. Probably a juvenile specimen of a species of *Philarius.*

Pontonia armata H. Milne Edwards, 1837. Synonym: *Anchistus* (?) *armatus* Borradaile, 1898. Distribution: New Ireland. Probably a species of *Anchistus.*

Pontonia maculata Stimpson, 1860. Distribution: Bonin Islands. Probably a species of *Anchistus.*

Pontonia unidens Kingsley, 1880. Distribution: Florida. Description insufficient to make identification of the species possible.

Species described as Pontoniinae, but not belonging in this subfamily:

Anchistia lacustris (Von Martens, 1857) Heller, 1866 = *Palaemonetes antennarius* (H. Milne Edwards, 1837) (Palaemoninae).

Anchistia migratoria (Heller, 1862) Heller, 1863 vid. *Pelias migratorius* Heller.

Coralliocaris mammillata Edmondson, 1931 = *Gnathophylloides mammillata* (Edmondson) (Gnathophyllidae).

Palaemonella gracilis Paulson, 1875 = *Palaemon elegans* Rathke, 1843 (Palaemoninae).

Palaemonella rathbunensis Borradaile, 1917a = *Brachycarpus* prob. *biunguiculatus* (Lucas, 1849) (Palaemoninae).

Pelias migratorius Heller, 1862 = *Palaemonetes antennarius* (H. Milne Edwards, 1837) (Palaemoninae).

Periclimenes lacustris (Von Martens, 1857) Giordani Soika, 1948 = *Palaemonetes antennarius* (H. Milne Edwards, 1837) (Palaemoninae).

Periclimenes migratorius (Heller, 1862) Pesta, 1912 vid. *Pelias migratorius* Heller.

Periclimenes portoricensis Schmitt, 1933 = juvenile of *Macrobrachium carcinus* (Linnaeus, 1758) (Palaemoninae).

Urocaridella borradailei Stebbing, 1923 = *Macrobrachium equidens* (Dana) (Palaemoninae). Vid. p. 2.

Urocaridella gracilis Borradaile, 1915 = *Leander urocaridella* Holthuis, 1950a (Palaemoninae) Vid. p. 2.

Vanderbiltia rosamundae Boone, 1935 = species incerta. This certainly is no Pontoniid prawn. It shows some resemblance to the Atyidae. It may be juvenile.

REPORT ON THE MATERIAL EXAMINED

Palaemonella Dana, 1852

Many species described as belonging to the present genus still are insufficiently known, as for instance *Palaemonella affinis* Zehntner, *Palaemonella batei* Borr. and *Palaemonella biunguiculata* Nobili. Others are incorrectly assigned to this genus. *Palaemonella elegans* Borr. evidently is an abnormal specimen of *P. tenuipes* as already supposed by Borradaile himself.

The oral parts of the two species of this genus at my disposal show the closest resemblance; the oral parts of *P. vestigialis* are figured here. The mandible bears a two-jointed palp of which the last joint is distinctly longer than the first. The incisor process ends in three distinct teeth, the median of which is slightly shorter than the outer two. The molar process is truncate and bears blunt knobs and teeth, no brushlike arranged spines were observed on the molar process. The maxillula has the two endites of about the same size and breadth, the inner lacinia is rather slender; the palp of the maxillula is distinctly bifid and ends in a sharp point. The maxilla has the inner lacinia deeply cleft, the palp is normal in shape and the scaphognathite is large but not very broad. The maxillipeds are quite normal in shape and all are provided with exopods. The basis and the coxa of the first maxilliped are separated by a distinct notch. In contradiction to Borradaile's (1917a) and Kemp's (1922) statements the podobranch of the second maxilliped is present in my specimens. The third maxilliped is slender, it bears a distinct arthrobranch.

The species till now known under the name *Palaemonella orientalis* has to be placed in a separate genus.

From Indonesian waters at present five species are known, two of which are represented in the collections at hand, both being recorded here for the first time from that region.

Palaemonella lata Kemp (figs. 1, 2,c, d)

Palaemonella lata Kemp, 1922, Rec. Indian Mus., vol. 24, p. 127, textfigs. 3-6.

Siboga Expedition

Station 7, near reef of Badjulmati, E. Java, 7° 55'.5 S, 114° 26' E; reef; March 11, 1899. — 2 specimens (one ovigerous female) 32 and 34 mm.

Snellius Expedition

Near Kupang, Timor; December 8, 1929. — 1 specimen 19 mm.

The rostrum in my specimens has 7 or 8 teeth above and 2 or 3 below. Of the dorsal teeth 2 are placed on the carapace, the third stands above or immediately behind the orbit. The fused portion of the two rami of the upper antennular flagellum seems to be very variable in length and in the number of segments out of which it consists. In Kemp's specimen the fused portion was

Fig. 1. *Palaemonella lata* Kemp. Second pereiopod. × 7.

formed of 5 segments, in my specimen from Kupang of 7, in those from Badjulmati of 12 and 16 segments respectively. In these last specimens the free portion of the shorter ramus, which as in the other specimens consists of 5 segments, is much shorter than half the fused portion, while in Kemp's specimen the two portions are equal in length. The variability of this character also is

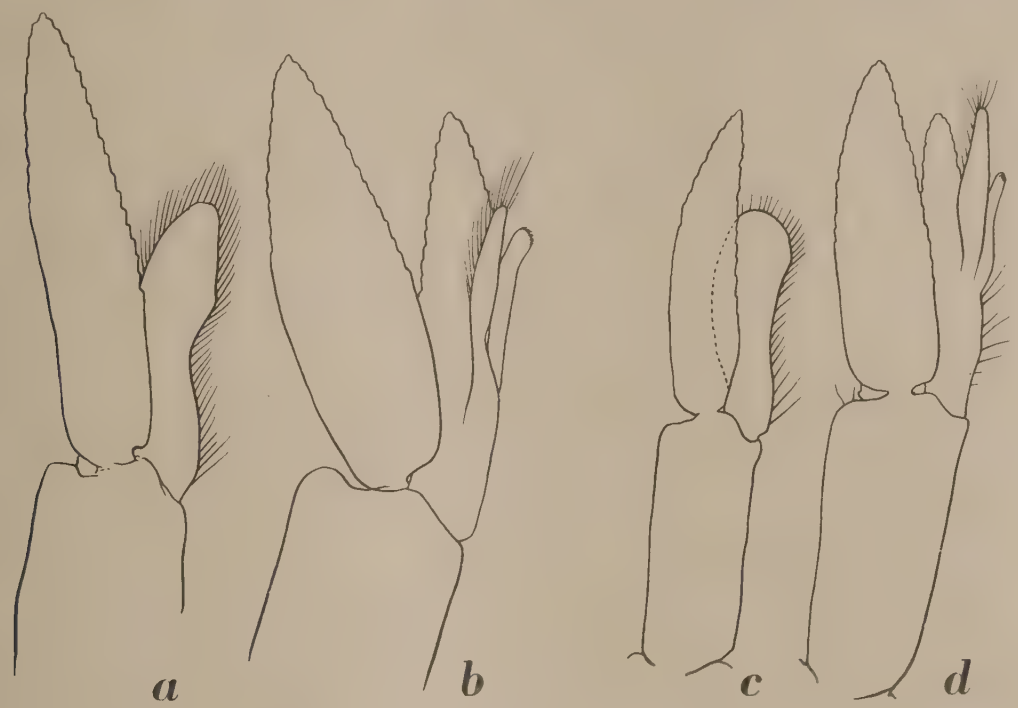

Fig. 2. *Palaemonella vestigialis* Kemp ♂. a, first pleopod; b, second pleopod. *Palaemonella lata* Kemp ♂. c, first pleopod; d, second pleopod. a-d, × 31.

indicated by the fact that in one of my specimens the shorter ramus of the left antennula differs in length from that of the right antennula. The scaphocerite much resembles the figure of Kemp, in my specimens the final tooth even fails to reach the end of the lamella. The fingers of the second pereiopod (fig. 1) are from $^2/_3$ to quite as long as the palm. The cutting edges resemble those of the chela figured by Kemp (fig. 5a, c), only behind the proximal tooth of the fixed finger 2 to 4 much smaller teeth are present, but these teeth sometimes are inconspicuous. The merus in my

specimens, like in that of Kemp, does not possess an anteroventral spine; in the Siboga specimens the anteroventral angle is more blunt than in the Snellius specimen, in which this angle is slightly produced.

The small differences between my specimens and Kemp's description undoubtedly are due to individual variation. Kemp's description has been made after a single specimen. In all important characters, as the total absence of a supraorbital spine (though a distinct postorbital ridge is present), the broad scaphocerite and the unarmed merus, my material entirely agrees with that of Kemp.

The oral parts of the present species are closely similar to those of *Palaemonella vestigialis*, which are figured on p. 26. In my specimens of *P. lata* the podobranch of the second maxilliped and the arthrobranch of the third maxilliped are better developed than in *P. vestigialis*. Kemp mentions that his specimen of the present species has the mandible provided with a palp of which the distal segment is much shorter than the proximal; this feature was thought by Kemp to be an individual abnormality. His opinion is confirmed by the fact that in my material the palp is normal in shape, having the last joint longer than the proximal.

The first and second pleopod of the male are figured here (figs. 2c, d). The first pleopod differs from that of *P. vestigialis* by having the endopod more rounded at the top; the second pleopod differs from that of *P. vestigialis* by having the appendix masculina longer than the endopod; the material at my disposal, however, is too small to ascertain the constancy of these characters.

The specimen from Kupang is provided with a Bopyrid beneath the carapace.

Vertical distribution. The species is a litoral form; Kemp's specimen was collected in a rockpool.

Horizontal distribution. The only record in literature is that of Kemp (1922) from Port Blair, Andaman Islands. The species now is recorded for the first time from the Malay Archipelago.

Palaemonella vestigialis Kemp (figs. 2a, b, 3)

Periclimenes vitiensis Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 234.
Palaemonella tenuipes Rathbun, 1906, Bull. U.S. Fish Comm., vol. 23 pt. 3, p. 925.
Palaemonella vestigialis Kemp, 1922, Rec. Indian Mus., vol. 24, p. 123, textfigs. 1, 2, pl. 3 fig. 2.
Palaemonella vestigialis Kemp, 1925, Rec. Indian Mus., vol. 27, p. 321.
Palaemonella spinulata Yokoya, 1936, Japan. Journ. Zool., vol. 7, p. 135, textfig. 4.
Palaemonella vestigialis Calman, 1939, Sci. Rep. John Murray Exped., vol. 6, p. 210.

Siboga Expedition

Station 7, near reef of Badjulmati, E. Java, 7° 55'.5 S, 114° 26' E; reef; March 11, 1899. — 1 specimen 11 mm.

Station 49a, Sape Strait, east of Sumbawa, 8° 23'.5 S, 119° 4'.6 E; dredge; depth 70 m; bottom coral and shells; April 14, 1899. — 1 specimen 14 mm.

Station 78, Lumulumu shoal, Borneo Bank; reef; depth 34 m; June 10 and 11, 1899. — 1 specimen 23 mm.

Station 80, Borneo Bank, 2° 25' S, 117° 43' E; trawl, Hensen quantitative net, Hensen vertical net, electric light in vertical net; depth 50-40 m, quantitative net from 34 m to surface; bottom fine coral sand; June 13, 1899. — 1 specimen 20 mm.

Station 99, anchorage off North Ubian, Sulu Islands, 6° 7'.5 N, 120° 26' E; dredge, townet; depth 16-23 m; Lithothamnionbottom; June 28-30, 1899. — 1 ovigerous female 16 mm.

Station 129, anchorage off Kawio and Kamboling Islands, Kawio Group, N.E. of Celebes; reef; depth 23-31 m; July 22 and 23, 1899. — 1 ovigerous female 17 mm.
Station 164, between Misool and New Guinea, 1° 42'.5 S, 130° 47'.5 E; dredge; depth 32 m; bottom sand, small stones and shells; August 20, 1899. — 2 specimens 12 and 18 mm.
Station 204, between the islands of Wowoni and Butung, northern entrance of Butung Strait, 4° 20' S, 122° 58' E; dredge and townet; depth from 75-94 m; bottom sand with dead shells; September 20, 1899. — 2 specimens 16 and 18 mm.
Station 273, anchorage off Djedan Island, eastcoast of Aru Islands; pearlbanks; depth 13 m; bottom sand and shells; December 23-26, 1899. — 4 specimens (one ovigerous female) 13-34 mm.
Station 299, Bokai or Cyrus Bay, southcoast of Rotti, 10° 52'.4 S, 123° 1'.1 E; depth up to 36 m; bottom mud, coral and Lithothamnion; January 27-29, 1900. — 1 specimen 10 mm.
Hainsisi, Semau Island (Station 60, April 27 and 28, 1899 or Station 303, February 2-5, 1900); depth 36 m. — 1 ovigerous female 12 mm.

Snellius Expedition

Off Bongao, Tawitawi, Sulu Islands; dredge 27 m; September 9, 1929. — 1 specimen 19 mm.
Kera near Timor; November 11-13, 1929. — 2 ovigerous females 15 and 17 mm.

Museum Amsterdam

Banda; leg. E. van der Velde. — 1 specimen 17 mm.

The specimens at my disposal agree well with Kemp's description and figures. Some characters, however, show a variability not mentioned in Kemp's description. Firstly the strength of the supraorbital spine: this spine in most specimens is vestigial, being of the same shape and size as figured by Kemp (1922, pl. 3 fig. 2); in some specimens, however, the spine is entirely wanting, though the postorbital ridge is distinct; in other specimens on the contrary a distinct, though rather small supraorbital spine is developed. Furthermore the fused portion of the two rami of the upper antennular flagellum according to Kemp consists of 8 to 10 joints. In my material that number varies between 8 and 18. This character like in *Palaemonella lata* thus is very variable and therefore is not to be used for specific distinction. The fixed finger of the second pereiopod often has the cutting edge provided with some small denticles behind the two large teeth. The two lobes in the inner and upper part of the anterior margin of the carpus may vary in sharpness, the upper lobe even may assume the shape of a distinct spine. The situation of the anteroventral spine of the merus of the second pereiopod is not entirely constant, in some specimens it is placed closer to the anterior margin than in others. The relation between the length of propodus and dactylus of the last three pereiopods in my material ranges between 3 and slightly more than 5.

Palaemonella spinulata Yokoya (1936) has the supraorbital spines distinct and the upper lobe of the anterior margin of carpus is developed into a rather strong spine. In all other characters I can find no difference with Kemp's description of *Palaemonella vestigialis*. As the two above mentioned differences fall within the range of variability of Kemp's species, *Palaemonella spinulata* can not be considered a valid species, but only as an extreme form of *Palaemonella vestigialis*, with which species it therefore must be synonymized.

Kemp (1922) already doubted the fact that *Palaemonella vestigialis* and *Palaemonella pottsi* (Borr.) should be two different species. The only differences Kemp could find probably all fall within the range of variation of *P. vestigialis*. For the same reasons as Kemp (the absence of

the second pereiopod in the male type specimen of *P. pottsi,* which perhaps may show some differences and the striking difference in the colourpattern and habitat of the two species) I do not synonymize them. It is necessary that specimens with the typical *pottsi* and *vestigialis* colourpattern be carefully compared before any conclusion on the identity of the species can be made.

The oral parts are shown in figs. 3a-e.

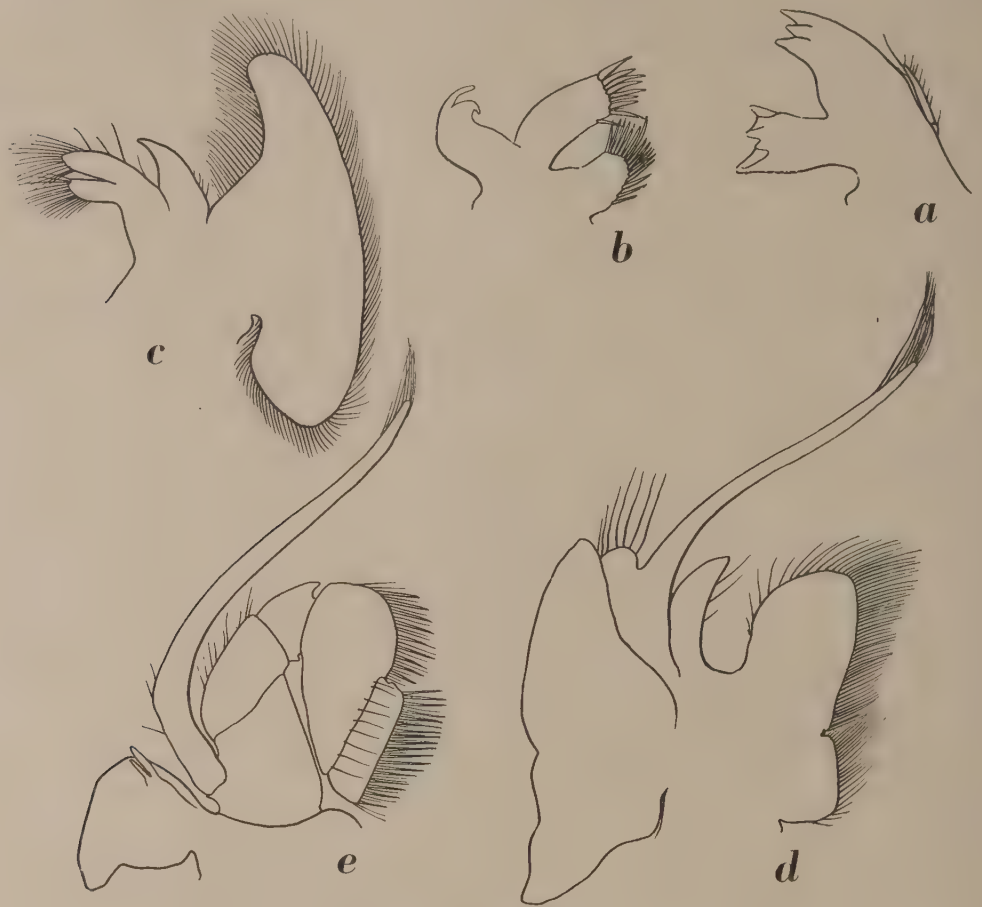

Fig. 3. *Palaemonella vestigialis* Kemp. a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped. a-e, × 28.

The differences between the shape of the first two pairs of pleopods of the male in the present species (figs. 2a, b) and those of the previous species have already been pointed out (p. 24).

The specimen from Beagle Bay, Papua, identified by Nobili (1899) as *Periclimenes vitiensis* still is present in the collection of the Museo Civico di Storia Naturale in Genoa, Italy, where I examined it. It proved actually to be a specimen of *Palaemonella vestigialis.*

In the U.S. National Museum, Washington D.C., I examined the specimen from the south-coast of Molokai brought by Rathbun (1906) to *Palaemonella tenuipes.* This specimen proved to belong to the present species. The specimen said by Rathbun to resemble *Palaemonella tridentata.* is a specimen of *Palaemonella* of which, however, the specific identity cannot be made out because of its imperfectness.

Vertical distribution. The species is a litoral form. The greatest depth from which it is recorded is 70 m (Siboga).

Horizontal distribution. Records in literature are: Tor and Ain Musa, Gulf of Suez (K e m p, 1922), Southern part of the Red Sea, 13° 31'.0 N, 42° 31'.0 E (C a l m a n, 1939), Cheval Paar, Ceylon (K e m p, 1922), Port Blair, Andaman Islands (K e m p, 1922), Nancowry, Nicobar Islands (K e m p, 1925), Cabusa Island, Mergui Archipelago (K e m p, 1922), Misaki, Japan (Y o k o y a, 1936), Beagle Bay, Papua (N o b i l i, 1899), South coast of Molokai, Hawaiian Archipelago (R a t h b u n, 1906). The materials of the Siboga and Snellius Expeditions show that the species is quite common throughout the Malay Archipelago.

The following three species, not present in the collections studied, are known from Indonesia:

Palaemonella tenuipes Dana

Palaemonella tenuipes Dana, 1852, Proc. Acad. nat. Sci. Philad., vol. 6, p. 25.
Palaemonella tenuipes Dana, 1852a, U.S. Explor. Exped., vol. 13, p. 582.
Palaemonella tenuipes Weitenweber, 1854, Lotos Praha, vol. 4, p. 60.
Palaemonella tenuipes Dana, 1855, U.S. Explor. Exped., vol. 13 atlas, p. 12, pl. 38 fig. 3.
? *Palaemonella tenuipes* Stimpson, 1860, Proc. Acad. nat. Sci. Philad., 1860, p. 40.
non *Palaemonella tenuipes* Heilprin, 1888, Proc. Acad. nat. Sci. Philad., 1888, p. 322.
? *Palaemonella tenuipes* De Man, 1888, Arch. Naturgesch., vol. 53 pt. 1, p. 551, pl. 22a fig. 4.
non *Palaemonella tenuipes* Heilprin, 1889, The Bermuda Islands, p. 151.
? *Palaemonella tenuipes* Ortmann, 1890, Zool. Jb. Syst., vol. 5, p. 527.
? *Palaemonella tenuipes* Zehntner, 1894, Rev. Suisse Zool., vol. 2, p. 208.
Palaemonella tridentata Borradaile, 1898, Proc. zool. Soc. Lond., 1898, p. 1007, pl. 64 fig. 8.
Palaemonella tridentata Anonymus, 1899, Mem. Aust. Mus., vol. 3, p. 518.
non *Palaemonella tridentata* Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 235.
non *Palaemonella tenuipes* Rankin, 1900, Ann. New York Acad. Sci., vol. 12, p. 538.
Palaemonella tenuipes Nobili, 1901a, Annu. Mus. zool. Univ. Napoli, vol. 1 pt. 3, p. 6.
Palaemonella tenuipes var. Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 70.
non *Palaemonella tenuipes* Rathbun, 1906, Bull. U.S. Fish Comm., vol. 23 pt. 3, p. 925.
Palaemonella tenuipes Bedot, 1909, Rev. Suisse Zool., vol. 17, p. 166.
Palaemonella tenuipes Balss, 1915, Denkschr. Akad. Wiss. Wien, vol. 91, suppl., p. 31.
Palaemonella elegans Borradaile, 1915, Ann. Mag. nat. Hist., ser. 8 vol. 15, p. 210.
Palaemonella tenuipes Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 358.
Palaemonella elegans Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 359, pl. 53 fig. 4.
Palaemonella tridentata Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, pp. 323, 358.
? *Palaemonella tenuipes* Balss, 1921, K. Svenska Vetensk. Akad. Handl., vol. 61 pt. 10, p. 14.
Palaemonella tenuipes Tattersall, 1921, Journ. Linn. Soc. Lond. Zool., vol. 34, p. 383.
? *Palaemonella tennipes* Urita, 1921, Zool. Mag. Tokyo, vol. 33, p. 217.
Palaemonella tenuipes Kemp, 1922, Rec. Indian Mus., vol. 24, p. 129, textfigs. 7b, 8.
Palaemonella tenuipes Verrill, 1922, Trans. Connect. Acad. Arts. Sci., vol. 26, pl. 43 fig. 2 (not p. 149).
Palaemonella tenuipes Edmondson, 1923, Bull. Bishop Mus. Honolulu, n. 5, p. 34.
Palaemonella tenuipes Edmondson, 1925, Bull. Bishop Mus. Honolulu, n. 27, p. 8.
? *Palaemonella tenuipes* Gurney, 1936, Proc. zool. Soc. Lond., 1936, p. 619.
Palaemonella tenuipes Edmondson, 1946, Spec. Publ. Bishop Mus. Honolulu, vol. 22, p. 252, fig. 152a.

The present species is closely related to *Palaemonella vestigialis*. The most distinct difference

between the two forms lies in the presence of a well developed subterminal spine at the upper inner aspect of the carpus of the second pereiopod in *P. tenuipes*. This feature is not mentioned in the old descriptions, Kemp (1922) being the first to point at the importance of this character. As *Palaemonella vestigialis* is much more common than the present species it is very probable that most of the specimens recorded in literature as *Palaemonella tenuipes* from the Indo-Westpacific region in reality belong to *P. vestigialis*. The *P. tenuipes* from the West Indies belongs to *Periclimenes americanus* (Kingsley). The specimen from Beagle Bay reported upon by Nobili, 1899, as *Palaemonella tridentata*, on examination proved to belong to *Periclimenes spiniferus* (De Man). Nobili's material is preserved in the Museo Civico di Storia Naturale in Genoa, Italy. As already pointed out (p. 26) Rathbun's (1906) *P. tenuipes* is a *P. vestigialis*. Examination of other material recorded in literature is badly needed. Of the specimen recorded by De Man from Amboina under the name *Palaemonella tenuipes* the identity will remain uncertain as it lacks both second pereiopods.

Vertical distribution. The species is a litoral form.

Horizontal distribution. Records in literature are: Red Sea (Nobili, 1906b), Eritrea (Nobili, 1901a, 1906b), Dahab, Ras Abu Somer, and Berenice, Red Sea (Balss, 1915), Khor Dongonab, and Suakin Harbour, Red Sea (Tattersall, 1921), Sarso Island, Red Sea (Balss, 1915), Jibuti (Nobili, 1906b), Goidu, Goifurfehendu Atoll, Maldive Archipelago (Borradaile, 1917a), Male Atoll (Ortmann, 1890), S. Nilandu Atoll, Maldive Archipelago (Borradaile, 1917a), Peros Banhos, Chagos Archipelago (Borradaile, 1917a; Kemp, 1922), Salomon Island (Borradaile, 1915, 1917a), Isle du Coin, Chagos Archipelago (Borradaile, 1917a), Kagoshima, Japan (Ortmann, 1890; Urita, 1921), Riukiu Islands (Stimpson, 1860), Sulu Sea (Dana, 1852), Amboina (De Man, 1888; Zehntner, 1894), Cape Jaubert, N.W. Australia (Balss, 1921), Funafuti (Borradaile, 1898; Anonymus, 1899), Wake and Johnston Islands (Edmondson, 1925), Palmyra (Edmondson, 1923).

Palaemonella affinis Zehntner

Palaemonella affinis Zehntner, 1894, Rev. Suisse Zool., vol. 2, p. 208.
Palaemonella affinis Bedot, 1909, Rev. Suisse Zool., vol. 17, p. 166.
Palaemonella affinis Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 358.

The description of this species by Zehntner is very short, he gives only its differences with his *Palaemonella amboinensis*, which species at present is placed in the genus *Periclimenes* under the name *P. brevicarpalis*. As Zehntner obviously does not separate the genera *Palaemonella* and *Periclimenes*, it even is not certain whether the specimen described by Zehntner as *Palaemonella affinis* really belongs to the genus *Palaemonella*.

Vertical distribution. The species was found on a specimen of the Crinoid genus *Actinometra*, probably in shallow water.

Horizontal distribution. The only record of this species is from Amboina.

? *Palaemonella longirostris* Borradaile

? *Palaemonella longirostris* Borradaile, 1915, Ann. Mag. nat. Hist., ser. 8 vol. 15, p. 210.
? *Palaemonella longirostris* Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, pp. 323, 359, pl. 53 fig. 5.
Palaemonella longirostris Boone, 1935, Bull. Vanderbilt mar. Mus., vol. 6, p. 163, pl. 43.

Boone (1935) described a Pontoniid prawn from Indonesia under the name *Palaemonella longirostris* Borr. According to the figure and description the specimen differs in a good many points so much from Borradaile's type, that it is hardly likely that they belong to the same species. These differences are:

1. The hepatic spine in the type is placed on about the same level as the antennal spine, in Boone's specimen it is on a much lower level.
2. The antennulae in the specimen from Bali are longer and the relation between the length of the three segments of the peduncle is different from that in the type.
3. In Boone's specimen the third maxilliped is much longer and stronger, it reaches distinctly beyond the scaphocerite, while in Borradaile's specimen it even fails to reach the middle of that scale.
4. The fingers of the first pereiopod in Boone's specimen are longer than the palm, in Borradaile's specimen they are about as long as the palm.
5. In Boone's specimen the fingers of the second leg are much longer and the carpus much shorter than in Borradaile's shrimp.
6. The dactyli of the last three pereiopods are biunguiculate in Boone's specimen, simple in that of Borradaile.

This last difference seems to be the most important and it alone seems already sufficient to separate the two forms. Having, however, seen neither of the two specimens, I will not take any decision in this question. In the present genus two species are known to have the dactylus of the last three pereiopods biunguiculate, viz., *P. biunguiculata* Nobili, and *P. batei* Borr. These two species are, however, insufficiently known. Boone's *P. longirostris* differs from *P. biunguiculata* in the shape of the rostrum, and in the shape of the pereiopods; it also shows differences with some of the known characters of *Palaemonella batei.*

Distribution. Boone's specimen was collected at Temukuş Roads, Bali, from coral. Borradaile's specimen originated from Naifaro, Fadiffolu Atoll, Maldive Archipelago.

Vir nov. gen.[1])

Definition: Pontoniid prawns living free or epizootic on Crinoidea. Body slender, not depressed. Rostrum well developed, compressed, provided with teeth. Carapace smooth, provided with antennal spines only, hepatic spines absent.

Abdomen slender. Pleurae of the first four segments broadly rounded.

Telson elongate; upper surface with two pairs of spinules; posterior margin with three pairs of spinules.

Eyes normal in shape, cornea hemispherical.

Basal segment of antennular peduncle broad, provided with statocyst. Stylocerite slender. Last two segments of antennular peduncle short. Upper antennular flagellum with two rami.

Scaphocerite well developed, elongate, with a distinct final tooth.

Mandible with (one-jointed ?) palp. Shape of mandible normal.

Exopods present on all maxillipeds.

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1) The present genus is named in honour of the late Dr. J. G. de Man.

First pereiopods slender. Second pereiopods equal in shape, sometimes unequal in size; chela slender, never strongly swollen, fingers elongate. Last three pereiopods slender. Dactylus of the last three pereiopods without basal protuberance.

Type species: *Palaemonella orientalis* Dana.

The species forming the present genus till now was included in the genus *Palaemonella*; the differences which it shows with the typical species of that genus, however, are so important that in my opinion it must be placed in a separate genus.

Vir orientalis (Dana)

Palaemonella orientalis Dana, 1852, Proc. Acad. nat. Sci. Philad., vol. 6, p. 26.
Palaemonella orientalis Dana, 1852a, U.S. Explor. Exped., vol. 13, p. 583.
Palaemonella orientalis Weitenweber, 1854, Lotos Praha, vol. 4, p. 60.
Palaemonella orientalis Dana, 1855, U. S. Explor. Exped., vol. 13 atlas, p. 12, pl. 38 fig. 4.
Palaemonella orientalis De Man, 1888, Arch. Naturgesch., vol. 53 pt. 1, p. 552.
non *Palaemonella orientalis* Bate, 1888, Rep. Voy. Challenger, Zool., vol. 24, p. 787, pl. 128 fig. 4.
non *Palaemonella orientalis* Rathbun, 1906, Bull. U. S. Fish Comm., vol. 23 pt. 3, p. 925.
Palaemonella orientalis Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 358.
Palaemonella orientalis Kemp, 1922, Rec. Indian Mus., vol. 24, p. 131, figs. 9-11.
Palaemonella orientalis Edmondson, 1925, Bull. Bishop Mus. Honolulu, vol. 27, p. 8.
non *Palaemonella orientalis* Estampador, 1937, Philipp. Journ. Sci., vol. 62, p. 48.
Palaemonella orientalis Edmondson, 1946, Spec. Publ. Bishop Mus. Honolulu, vol. 22, p. 252, fig. 152c.

Kemp points to some differences between his specimens and De Man's (1888) description; I think, however, that there is little doubt that De Man's specimens are correctly referred to the present species.

The specimen recorded by Bate (1888) from the Philippines under the name *Palaemonella orientalis* can not belong to the present species as the dactyli of the last three pereiopods are biunguiculate. Borradaile (1917a) therefore renamed it *Palaemonella batei*; as nothing is known about the mandible of that species, it is not certain to which genus it belongs; it is, however, not impossible that the species must be inserted in the present genus.

The specimens from the Hawaiian Archipelago mentioned by Rathbun (1906) under the name *Palaemonella orientalis* too do not belong there. This was already found by Borradaile (1917a), who made those specimens the type of a new species which he named *Palaemonella rathbunensis*. Examination of Rathbun's material, which is preserved in the U.S. National Museum at Washington, D.C., showed it to belong to a species of *Brachycarpus*, in all probability *B. biunguiculatus* (Lucas). As the specimens are not quite adult the identity could not be made fully certain.

Estampador's (1937) record of *Palaemonella orientalis* from the Philippines is based on Bate's specimen.

Vertical distribution. The species is a litoral form.

Horizontal distribution. Records in literature are: Port Blair, Andaman Islands (Kemp, 1922), Sulu Sea (Dana, 1852), Amboina (De Man, 1888), Pearl and Hermes Reef, Hawaiian Archipelago (Edmondson, 1925), Hawaii (Edmondson, 1946).

Periclimenes Costa, 1844

Kemp (1922) united the genera *Urocaris, Ancylocaris, Periclimenaeus* and *Periclimenes,* and the five subgenera of the latter genus, *Corniger, Cristiger, Ensiger, Falciger,* and *Hamiger,* as accepted by Borradaile (1917a), to one large genus *Periclimenes* with three subgenera: *Periclimenes* s.s., *Periclimenaeus,* and *Ancylocaris.* I agree for the larger part with Kemp's conception of the size of the genus *Periclimenes;* in my opinion, however, *Periclimenaeus* is generically distinct from *Periclimenes.*

Kemp (1922), in his paper on the Pontoniinae of the Indian Museum, gives an excellent revision of the present genus; in his study keys to all known species and good descriptions and figures of many forms have been given. According to later investigations the following additions and corrections have to be made to Kemp's paper:

1. After the publication of Kemp's paper the following species of *Periclimenes* have been described as new (not including the new species described in the present paper):

Periclimenes (*Ancylocaris*) *rathbunae* Schmitt, 1924a.

Periclimenes antiguensis Schmitt, 1924b. This species belongs in the genus *Anchistioides.*

Periclimenes (*Periclimenes*) *signatus* Kemp, 1925.

Periclimenes portoricensis Schmitt, 1933. As is shown by the description and figures this is a juvenile specimen of *Macrobrachium carcinus* (L.).

Periclimenes bicolor Edmondson, 1935. This species is identical with *Periclimenes* (*Periclimenes*) *soror* (see p. 53).

Periclimenes (*Ancylocaris*) *akiensis* Kubo, 1936.

Periclimenes maxillulidens Schmitt, 1936. This species belongs in the genus *Periclimenaeus.*

Periclimenes (*Ancylocaris*) *lucasi* Chace, 1937.

Periclimenes (*Ancylocaris*) *crassipes* Calman, 1939. This species is identical with *Periclimenaeus tridentatus* (Miers).

Periclimenes (*Periclimenaeus*) *arabicus* Calman, 1939. This species belongs in the genus *Periclimenaeus.*

Periclimenes (*Periclimenaeus*) *bermudensis* Armstrong, 1940. This species belongs in the genus *Periclimenaeus.*

Periclimenes (*Periclimenes*) *curvirostris* Kubo, 1940.

Periclimenes (*Ancylocaris*) *amamiensis* Kubo, 1940.

Periclimenes (*Ancylocaris*) *gracilirostris* Kubo, 1940. This species is identical with *Periclimenes* (*Periclimenes*) *hertwigi* Balss.

Periclimenes (*Periclimenes*) *perryae* Chace, 1942.

Periclimenes (*Periclimenes*) *harringtoni* Lebour, 1949.

Periclimenes (*Periclimenes*) *iridescens* Lebour, 1949.

Periclimenes (*Ancylocaris*) *bermudensis* Lebour, 1949. This species is identical with *Periclimenes* (*Harpilius*) *americanus* (Kingsley).

Periclimenes (*Periclimenes*) *granulatus* Holthuis, 1950b.

Periclimenes (*Harpilius*) *platalea* Holthuis, 1951.

Periclimenes (*Periclimenes*) *pandionis* Holthuis, 1951a.

Periclimenes (*Harpilius*) *magnus* Holthuis, 1951a.

Periclimenes (*Harpilius*) *pauper* Holthuis, 1951a.
Periclimenes (*Harpilius*) *veleronis* Holthuis, 1951a.

2. *Harpilius lutescens* Dana, the type species of the genus *Harpilius* Dana, 1852, in my opinion must be referred to the genus *Periclimenes;* it has to be placed in the subgenus *Ancylocaris* Schenkel, 1902. As the name *Harpilius* is older than *Ancylocaris,* the former must be used for the subgenus.
3. *Periclimenes ceratophthalmus* Borr., placed by Kemp (1922) in the subgenus *Ancylocaris* (= *Harpilius*) in reality belongs to the subgenus *Periclimenes* s.s. (vid. Kemp, 1925).
4. *Periclimenes hertwigi* Balss, considered by Kemp as a species incerta is a true *Periclimenes* and belongs to the subgenus *Periclimenes* s.s.
5. In Kemp's key to the species of the subgenus *Periclimenes* the species *P. incertus* is wrongly placed near *P. parvus* (vid. p. 39).
6. *Periclimenes* (*Harpilius*) *potina* Nobili is identical with *P. brevicarpalis* (vid. p. 72).
7. *Periclimenes brocki* (De Man) placed by Kemp in the second section of the subgenus *Ancylocaris* (= *Harpilius*) in reality belongs in the first section of that subgenus (vid. p. 88).
8. *Coralliocaris atlantica* Rathb. is referred by Schmitt (1935) to the present genus; in my opinion it belongs to *Periclimenaeus.*
9. *Periclimenes gorgonidarum* Balss, considered by Kemp as a species incerta, belongs in the genus *Periclimenaeus.*
10. *Anchistia aurantiaca* Dana, considered by Kemp as a species incerta is identical with *Anchistus custos* (Forssk.).
11. *Periclimenes tenellus* (Smith) placed by Kemp in his subgenus *Ancylocaris,* in reality belongs to *Periclimenes* s.s. as was shown by examination of material of that species.
12. *Palaemonella yucatanica* Ives is no *Palaemonella* at all but belongs to the subgenus *Periclimenes* s.s.
13. The species named by Kemp (1922) *Periclimenes* (*Ancylocaris*) *holmesi* Nobili proved to be a *Palaemonella.*

Subgenus **Periclimenes** s.s.

The oral parts of the species of the present subgenus examined by me showed in most points a close resemblance to those of *Palaemonella.* Figures of all oral parts (with the exception of the third maxilliped) are given here of *P. amethysteus* (Risso), the type of the genus (fig. 4a-f). The most important characters of the oral parts of the present subgenus are the following: The mandible lacks the palp, the molar process is usually somewhat stronger than the incisor process; the difference, however, never is large. The incisor process is tapering and mostly ends in three, sometimes in more teeth; aberrant are *P. ceratophthalmus,* in which species the incisorprocess widens distally and is provided at the end with about 9 teeth, one of which is very broad, and *P. soror* in which species many small denticles are placed between the two lateral teeth, furthermore in *P. indicus* and *P. soror* the concave margin of the incisor process is more or less distinctly serrate. The molar process of *Periclimenes* bears blunt knobs and ridges, which mostly are provided with brushlike arranged spines; in *P. hertwigi* no such spines are present, while in *P. impar* the number of these spines is very small. *P. soror* is remarkable for the slender molar process, which is more or less cylindrical in shape and bears no knobs. The maxillula has the inner lacinia rather narrow; the upper lacina is more or

less distinctly swollen in the middle. The palp ends in a sharp mostly strongly curved point, it is often bilobed, but the upper lobe may diminish in size till it is entirely absent (cf. *P. hertwigi, P. aesopius, P. pectiniferus*). The maxilla has the inner lacinia distinctly and generally deeply bilobed, the lower lobe is often narrower and sometimes shorter than the upper (in a specimen of *P. amethysteus* examined by me the lacinia is not bilobed, but entire; this evidently is an abnormality as other specimens of the same species from the same locality have the lacinia deeply cleft). The scaphognathite is large and sometimes rather broad. The first maxilliped has the basis and coxa sometimes very distinctly separated by a notch, this notch may become indistinct or even may disappear entirely.

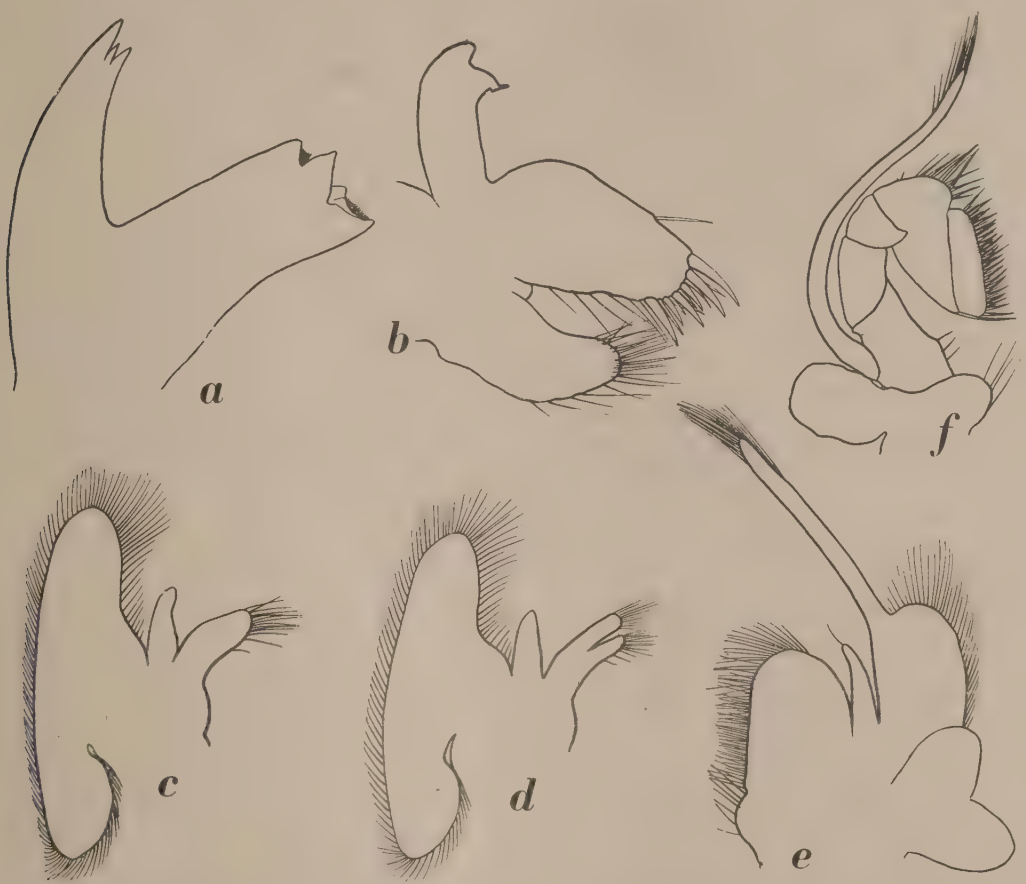


Fig. 4. *Periclimenes amethysteus* (Risso). a, mandible; b, maxillula; c, maxilla, abnormal; d, maxilla, normal; e, first maxilliped; f, second maxilliped. a, × 50; b, × 42; c-f, × 21.

The palp is rather variable in size. The caridean lobe of the exopod is rather large, it is variable in breadth. The epipod is large, variable in size, sometimes it is distinctly bilobed, but all transitions to an entire epipod occur. The second maxilliped has the same shape as that of *Palaemonella,* the podobranch is usually absent, sometimes a vestige of such a podobranch is visible. The third maxilliped is slender, an arthrobranch is present, though it is sometimes small. All maxillipeds are provided with exopods.

Of five species of the present subgenus the shape of the endopod of the first pleopod of the male is known. In three species (*P. impar, indicus* and *latipollex*) this appendage shows a broad

distally directed tooth at the end of the inner margin, in the other two (*P. parvus* and *soror*) a blunt irregular protuberance is present in the same place.

Of the present subgenus 10 species are known from Indonesia, all of which are represented in the collections at hand, 9 of them recorded for the first time from that region; one of these species is entirely new to science.

Periclimenes (*Periclimenes*) *aesopius* (Bate) (figs. 5, 6)

Anchistia aesopia Bate, 1863, Proc. zool. Soc. Lond., 1863, p. 502, pl. 41 fig. 5.
Anchistia aesopia Haswell, 1882, Catal. Aust. Crust., p. 194.
Urocaris longicaudata Pearson, 1905, Rep. Ceylon Pearl Oyster Fish., vol. 4, p. 78, pl. 1 fig. 5. (non Stimpson, 1860).
Urocaris aesopius Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 354.
Periclimenes aesopius Kemp, 1922, Rec. Indian Mus., vol. 24, p. 142, fig. 12.
Periclimenes aesopius Hale, 1927, Crust. S. Aust., vol. 1, p. 56, fig. 50.
Periclimenes aesopius Hale, 1928, Rec. S. Aust. Mus., vol. 4, p. 95.

Siboga Expedition

Station 33, Bay of Pidjot, Lombok; trawl, dredge and shore exploration; depth 22 m and less; bottom mud, coral and coral sand; March 24-26, 1899. — 1 ovigerous female 25 mm.
Station 164, between New Guinea and Misool, 1° 42'.5 S, 130° 47'.5 E; dredge; depth 32 m; bottom sand, small stones and shells; August 20, 1899. — 1 ovigerous female 26 mm.
Station 240, Banda anchorage; trawl, dredge and reef exploration; depth 45 m and less; bottom black sand, coral, lithothamnion; November 22 till December 1, 1899. — 2 ovigerous females 29 and 31 mm.
Station Banda; depth 9-36 m; November 22 till December 1, 1899. — 1 specimen 28 mm.

Some specimens at my disposal have the rostrum straight, in others it is directed obliquely upward. It does not reach further than the middle of the third segment of the antennular peduncle and sometimes even gets only slightly beyond the end of the basal segment. The upper margin bears 8 to 11 teeth, one or two of which are placed on the carapace behind the orbit; the first tooth is placed farther from the second than the second is from the third, generally the proximal teeth are stronger and more widely spaced than the distals. The lower margin of the rostrum is slightly concave, with one or two teeth placed close to the apex; the rest of the margin is entire and provided with feathered setae. The carapace is smooth and bears antennal and hepatic spines. The antennal spine is placed below the strongly produced and sharply pointed lower orbital angle. The hepatic spine is stronger than the antennal spine, it is situated much behind that spine and on a lower level. The anterolateral angle of the carapace is rectangularly rounded.

The abdomen is smooth. The pleurae of the first five segments are rounded, those of the first three are more broadly rounded than those of the fourth and fifth segments. The third segment bears in the median posterior part a high, blunt, and compressed tooth-like process, which is produced farther posteriorly than the rest of the posterior margin of the segment. The sixth abdominal segment is twice as long as the fifth.

The telson measures about $^2/_3$ of the length of the sixth segment. The dorsal surface of the telson is provided with two pairs of spinules; the anterior pair is situated slightly behind the middle of

the telson. The posterior pair of spines lies between the anterior pair and the posterior margin of the telson, in some specimens it is nearer to the anterior pair, in others nearer to the posterior margin. This posterior margin is provided with three pairs of spinules: the outer pair is shortest, the intermediate pair longest, while the inner pair is somewhat shorter than the intermediate and much more slender than it.

The eyes are well developed and reach $^3/_4$ of the length of the basal segment of the antennular peduncle. The cornea is globular, distinctly broader and much shorter than the ophthalmic peduncle, which in comparison to other species is relatively long.

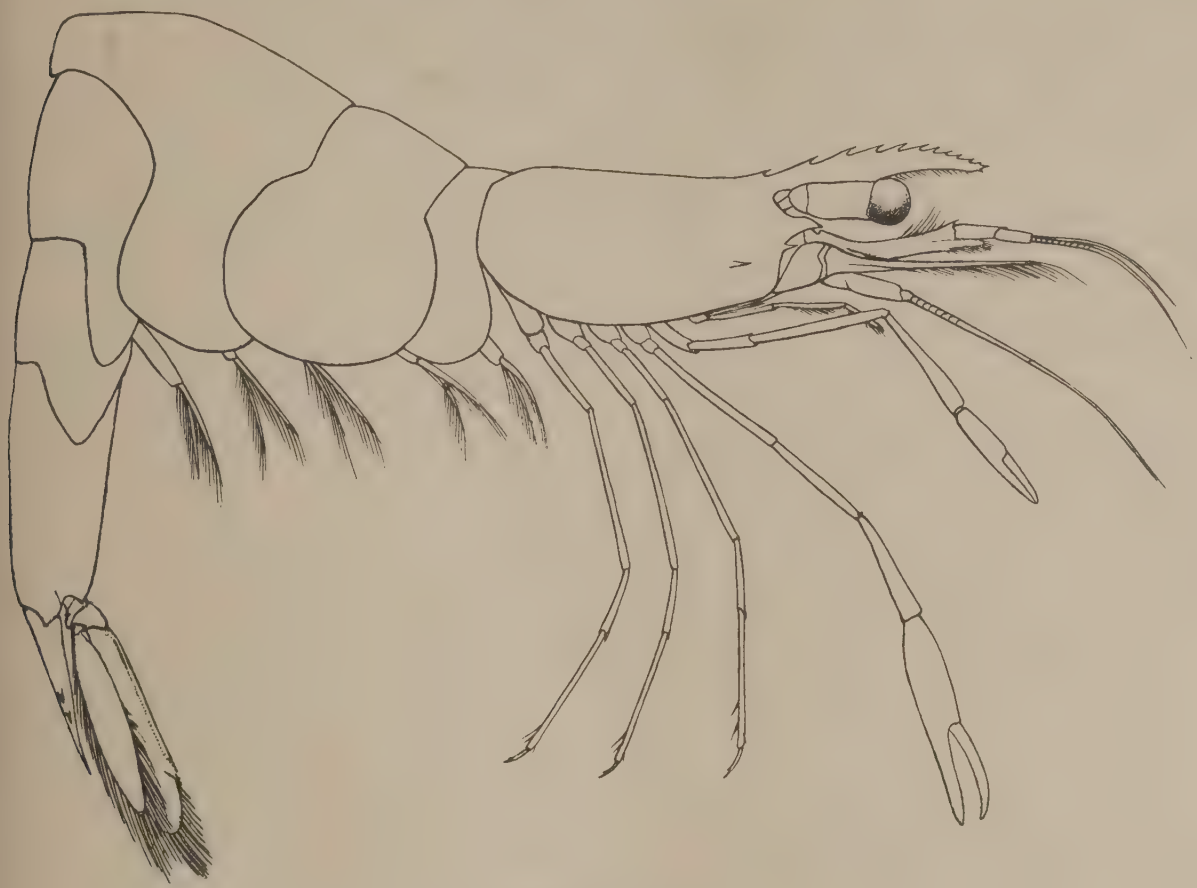


Fig. 5. *Periclimenes aesopius* (Bate). × 11.

The basal segment of the antennular peduncle has the stylocerite rather small, slender and sharply pointed, reaching almost the middle of the basal segment. The anterolateral angle of the basal segment bears a small but distinct tooth. The anterior margin of the segment is strongly forwards produced, reaching about the middle or even the end of the second segment and reaching far beyond the anterolateral tooth of the basal segment. The second segment is slightly longer and distinctly broader than the third segment, together they measure about $^3/_4$ of the length of the basal segment. The upper antennular flagellum has the two rami fused for about seven joints; the free part of the shorter ramus is slightly more than half as long as the fused part.

The scaphocerite reaches to the end of the antennular peduncle; the outer margin is straight

or slightly concave, ending in a strong tooth. The lamella is almost of the same breadth throughout its entire length, it reaches far beyond the final tooth and the inner anterior angle is rather acute. The antennal peduncle bears a small exterior tooth, its last segment fails to reach the middle of the scaphocerite.

The mouthparts are typical. The third maxilliped reaches the end of the antennal peduncle. The ultimate segment is about $^3/_4$ of the penultimate. The antepenultimate segment is somewhat

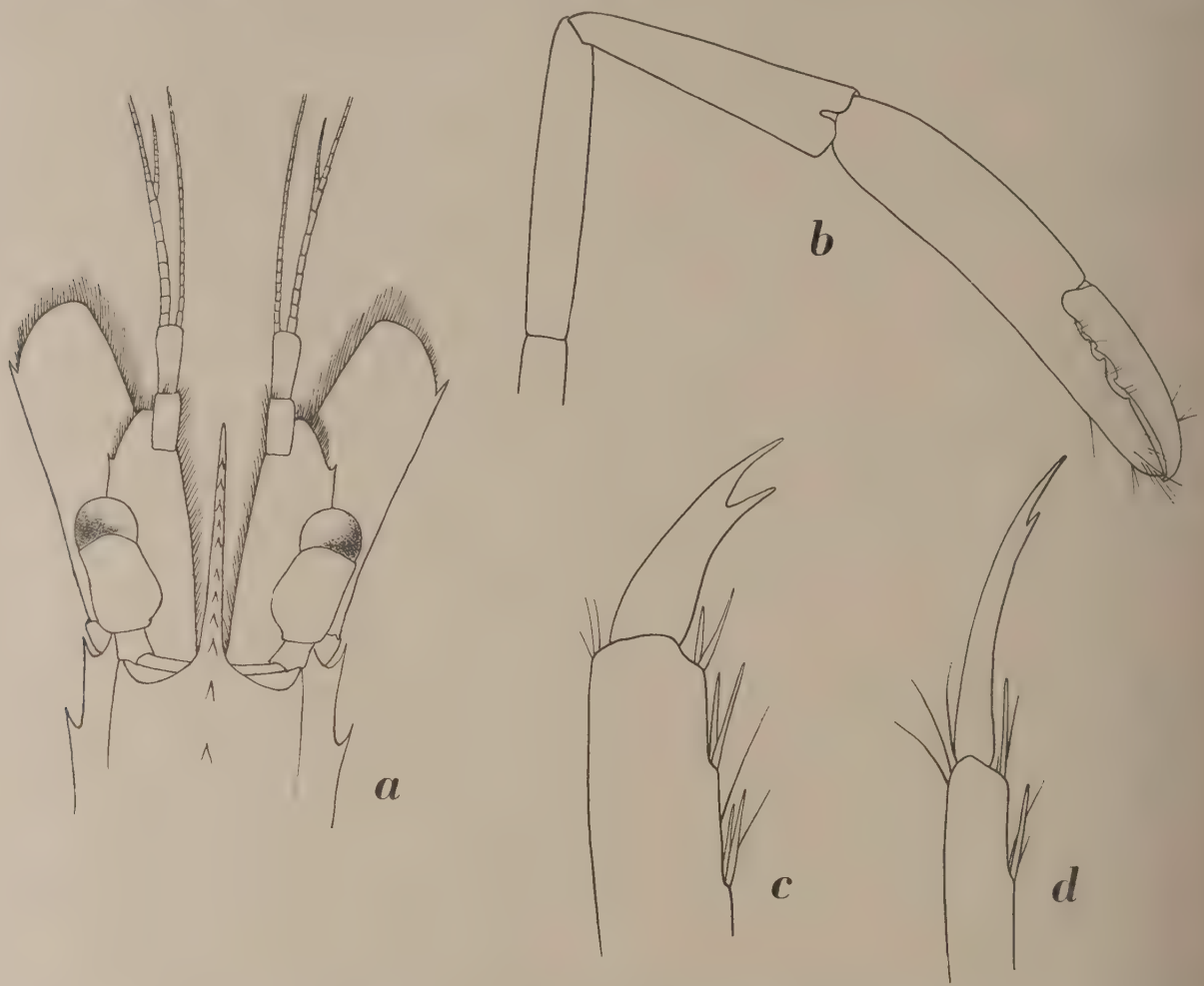


Fig. 6. *Periclimenes aesopius* (Bate). a, anterior part of body, dorsal view; b, second pereiopod; c, dactylus third pereiopod (specimen from Siboga Sta. 240); d, dactylus third pereiopod (specimen from Siboga Sta. 33). a, b, × 15; c, d, × 63.

longer than the penultimate and is distinctly curved. The exopod fails to reach the end of the antepenultimate segment.

The first pereiopod reaches with the fingers, or slightly more, beyond the scaphocerite. These fingers are unarmed and about as long as the palm. The carpus is as long as or slightly longer than the chela, narrowing posteriorly. The merus is somewhat longer than the carpus. The ischium is about half as long as the merus. The second pereiopods (fig. 6b) are equal, slender, reaching with about half the carpus or with the chela only, beyond the scaphocerite. The fingers have the cutting edges unarmed in some specimens, in other specimens, however, two small teeth are present on the cutting

edge of the dactylus and three stronger ones on that of the fixed finger. Between the two teeth on the dactylus generally a distinct gap is visible. The palm is as long as or slightly longer than the fingers. The carpus measures 1/2 to 2/3 of the length of the propodus, it narrows posteriorly and is unarmed. The merus is as long as or longer than the carpus and is unarmed too. The ischium is slightly longer than the merus. The last three pereiopods are slender. The third reaches beyond the scaphocerite. The dactylus is distinctly biunguiculate; the shape of the dactylus is variable: in the ovigerous female from Sta. 33 it is long and slender (fig. 6d), being about 1/4 of the length of the propodus, in the ovigerous females from Sta. 240 it is much shorter and stouter (fig. 6c), measuring somewhat more than 1/6 of the length of the propodus. That this character is variable is shown by an other specimen in which the shape of the dactylus is intermediate between those of the extremes mentioned. The propodus bears some spinules in the distal part of the posterior margin. The carpus is about half as long as the propodus or less. The merus is slightly longer than the propodus and the ischium is somewhat longer than the carpus.

The uropods are longer than the telson. The exopod has the outer margin almost straight or slightly convex, ending into two spines; the lower surface is provided with a longitudinal row of setae near the outer margin.

The specimens at hand differ in some minor respects from the descriptions and figures given in literature. So for instance in the specimens of Bate (1863) and Hale (1927) the rostrum reaches distinctly beyond the antennular peduncle and is provided with three teeth on the carapace behind the orbit. Kemp (1922) states the carpus of the first pereiopod to be 3/4 as long as the chela, which also is figured in Hale's (1927) figure, in my specimens it is distinctly longer than 3/4 of the chela. In Hale's (1927) figure the pleurae are shown with the tips abruptly narrowing into small lobes. This feature is not figured by Bate and is altogether absent in my material. Bate (1863) figures the fused portion of the two rami of the upper antennular flagellum to consist of numerous segments, just like is done by Pearson (1905), in my specimens only 6 or 7 segments are fused, but as already pointed out under *Palaemonella lata* and *vestigialis,* this character often is very variable. These differences between my material and the specimens described in literature are too small to justify specific or even varietal separation, the more so as too little is known about the variability of the various characters.

The specimen from Ceylon, which Pearson (1905) thought to belong to the Atlantic *Urocaris longicaudata,* and which was identified by Kemp (1915) with some hesitation with his *Urocaris indica,* no doubt belongs to the present species, as is shown by the description and figures. In those, namely characters are mentioned as the biunguiculate dactylus, the hump at the third abdominal segment, the produced anterior margin of the basal segment of the antennular peduncle, the elongate eyes and the general shape of the rostrum, which are typical for *P. aesopius.*

Vertical distribution. The species is a litoral form, the greatest depth from which it is known is 32 m (Siboga).

Horizontal distribution. The species is recorded in literature from: Aripu Paar, Ceylon (Pearson, 1905), and from St. Vincent Gulf, S. Australia (Bate, 1863; Haswell, 1882; Borradaile, 1917a; Kemp, 1922; Hale, 1927, 1928). The localities of the Siboga material collected in the Malay Archipelago fill the gap, which existed between the two widely separated localities known in literature.

Periclimenes (*Periclimenes*) *impar* Kemp (fig. 7)

Periclimenes (*Periclimenes*) *impar* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 147, textfigs. 16, 17, pl. 3 fig. 1.

Periclimenes (*Periclimenes*) *impar* Kemp, 1925, Rec. Indian Mus., vol. 27, p. 322.

Siboga Expedition

Station 50, Bay of Badjo, westcoast of Flores; dredge, trawl and shore exploration; depth up to 40 m; bottom mud, sand and shells according to locality; April 16-18, 1899. — 5 specimens 9-15 mm.

Station 273, anchorage of Djedan Island, eastcoast of Aru Islands; pearlbanks; trawl, dredge and divers; depth 13 m; bottom sand and shells; December 23-26, 1899. — 8 specimens 6-13 mm.

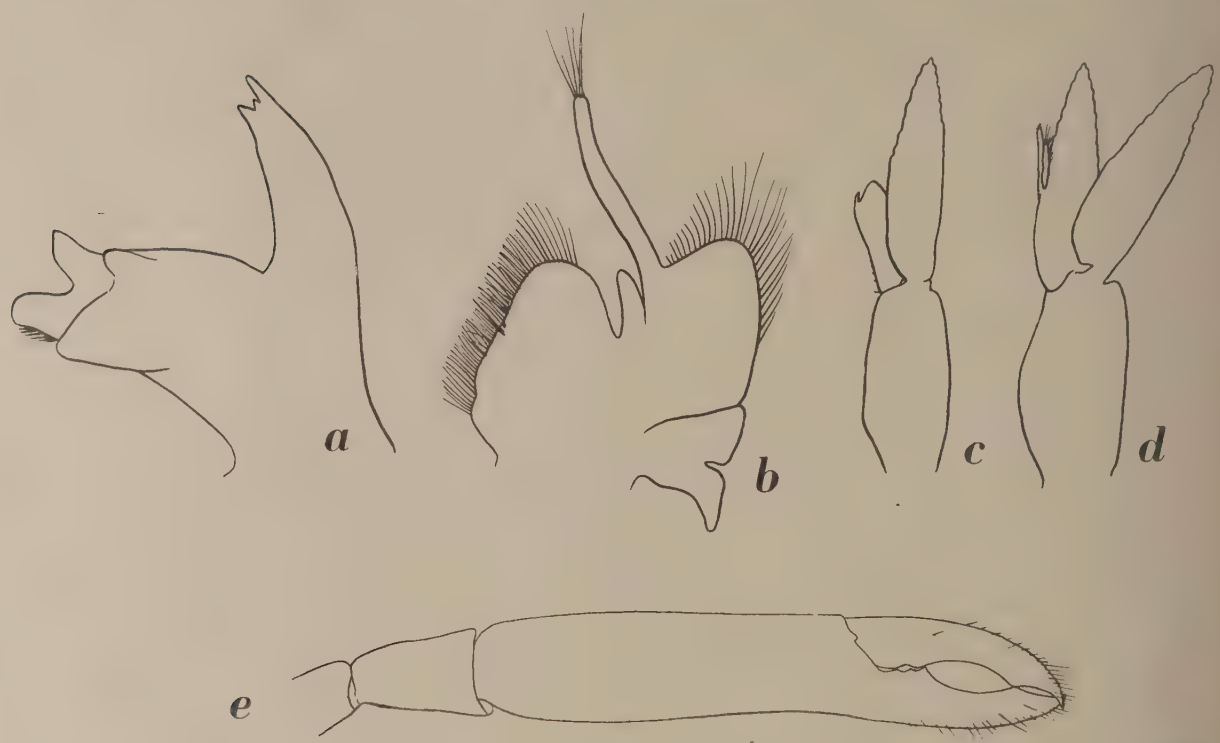


Fig. 7. *Periclimenes impar* Kemp. a, mandible; b, first maxilliped; c, first pleopod of male; d, second pleopod of male; e, chela of second leg. a, × 150; b, × 75; c-e, × 30.

In most respects there is good agreement between my specimens and Kemp's (1922) description and figures. The first tooth of the rostrum mostly is further separated from the second than the third is, like in the specimen described by Kemp (1925). In all specimens examined only one ventral tooth is present in the rostrum. The outer margin of the scaphocerite is about straight and its inner angle is not so broad as figured by Kemp (1922). The first pereiopods are generally more slender. The gape between the fingers of the second pereiopod, as described by Kemp (1922), is very distinct in many specimens (fig. 7e) in others, mostly small specimens, it is less conspicuous or even entirely absent. In my specimens in which both second pereiopods are present, these always are unequal. The third pereiopods reach the end of the scaphocerite, as is shown in Kemp's (1922) pl. 3 fig. 1; in his description he states that the third pereiopod only reaches the end of the first segment of the antennular peduncle. The dactyli of the last three pereiopods are short, just like described by Kemp.

The oral parts of the present species show much resemblance to those of *P. amethysteus*. The spines of the molar process of the mandible (fig. 7a) are smaller in number; the caridean lobe in the first maxilliped is rather broad and the epipod is deeply cleft (fig. 7b).

The first two pleopods of the male are shown in figs. 7c, d. The endopod of the first pleopod is remarkable for the toothlike process at the distal end of the inner margin.

Periclimenes incertus Borr. is separated by Kemp (1922) from *P. impar* by the fact that in *P. impar* at least one tooth of the dorsal series of the rostrum is placed on the carapace, while in *P. incertus* all teeth are situated on the rostrum proper. This is not true: in *P. incertus* namely the first tooth of the dorsal margin of the rostrum is placed behind the orbit. It is possible therefore that *P. incertus* will show to be identical with *P. impar*. There is however too little known about *P. incertus* to make this supposition certain; Borradaile, namely, only mentioned some differences between *P. incertus* and *P. parvus*. Furthermore Borradaile's pl. 53 fig. 7 of *P. incertus* shows the carpus of the first pereiopod much longer than the chela, while in *P. impar* the chela and carpus are of the same length. Examination of Borradaile's type is needed to show either the identity of or the real differences between the two forms.

Distribution. This litoral species is recorded in literature from: Cheval Paar, Ceylon (Kemp, 1925) and Port Blair, Andaman Islands (Kemp, 1922). *P. incertus* has been collected at S. Nilandu Atoll, Maldive Archipelago (Borradaile, 1915, 1917a).

Periclimenes (*Periclimenes*) *indicus* (Kemp) (fig. 8)

Urocaris indica Kemp, 1915, Mem. Indian Mus., vol. 5, p. 275, textfig. 26, pl. 13 fig. 9.
Periclimenes (*Periclimenes*) *indicus* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 144, textfig. 13.
Periclimenes (*Periclimenes*) *indicus* Kemp, 1925, Rec. Indian Mus., vol. 27, p. 322.
Periclimenes indica Panikkar & Aiyar, 1939, Proc. Indian Acad. Sci., vol. 9 B, p. 353.

Siboga Expedition

Station 47, Bay of Bima, Sumbawa; trawl, dredge and shore exploration; depth 55 m; bottom mud with patches of fine coral sand; April 8-12, 1899. — 31 specimens (included ovigerous females) 9-14 mm.

Snellius Expedition

Paleleh, Celebes; shore; August 21 and 22, 1929. — 1 specimen 8 mm.

A fine series of 31 specimens, among which several ovigerous females, was obtained by the Siboga Expedition. My specimens entirely agree with Kemp's description and figures.

The mandible of the present species (fig. 8a) shows a row of small teeth along the concave margin of the incisor process, these teeth, however, in some specimens are less distinct than in the mandible figured here. In other respects the oral parts closely resemble those of *P. aesopius*, only the upper lobe of the palp of the maxillula is less distinct.

The endopod of the first pleopod (fig. 8b) in the male shows very much resemblance to that of *P. impar*.

Kemp already pointed to the large resemblance between this species and *Periclimenes* (*Periclimenes*) *infraspina* Rathbun from California.

Distribution. The species is recorded in literature from: Pamban and Kilakarai, Gulf of Manaar (Kemp, 1915, 1922), Ennur backwater and Adyar River near Madras (Kemp, 1915, 1922), Madras (Panikkar & Aiyar, 1939), Chilka Lake, Orissa Coast (Kemp, 1915, 1922),

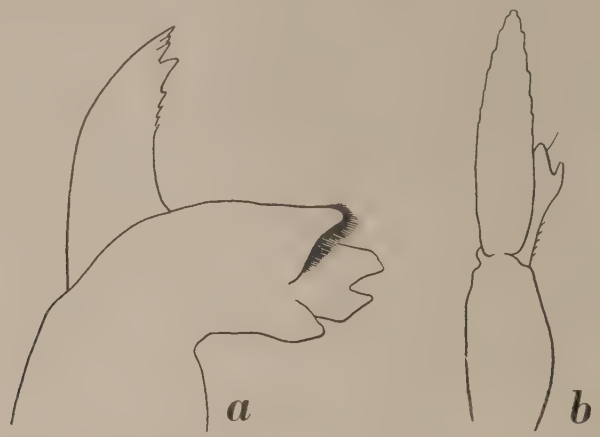


Fig. 8. *Periclimenes indicus* (Kemp). a, mandible; b, first pleopod of male. a, b, × 50.

Camorta Island, Nicobar Islands (Kemp, 1925). It is found in fresh-, brackish as well as in pure seawater. The present records from the Malay Archipelago largely extend the known range of distribution of the species.

Periclimenes (*Periclimenes*) *parvus* Borradaile (figs. 9, 10)

Periclimenes parvus Borradaile, 1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 384.
Periclimenes parvus Borradaile, 1899, Willey's Zool. Res., vol. 4, p. 407, pl. 36 fig. 3.
Periclimenes (*Cristiger*) *parvus* Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 363.
Periclimenes (*Periclimenes*) *parvus* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 149.

Siboga Expedition

Station 79b, Kabala dua Island, Borneo Bank; reef; depth 22 m; June 12 and 13, 1899. — 1 specimen 15 mm.

The present specimen is the second of this species recorded. A full description of the species therefore, will not be superfluous:

The rostrum is short, reaching slightly beyond the antennular peduncle; it is rather high and directed somewhat downward. The upper margin bears six rather broad and aequidistanced teeth, all of which are placed in advance of the posterior margin of the orbit. The lower margin of the rostrum bears one tooth, which is placed near the apex. The carapace is smooth, provided with an antennal and a hepatic spine; the antennal spine is placed below the rather acute lower angle of the orbit, the hepatic spine is situated on a level below and behind the antennal. The anterolateral angle of the carapace is bluntly rectangular.

The abdominal segments are smooth. The pleurae of the first three segments are broadly truncated, those of the fourth and fifth segment are directed posteriorly and rounded. The third

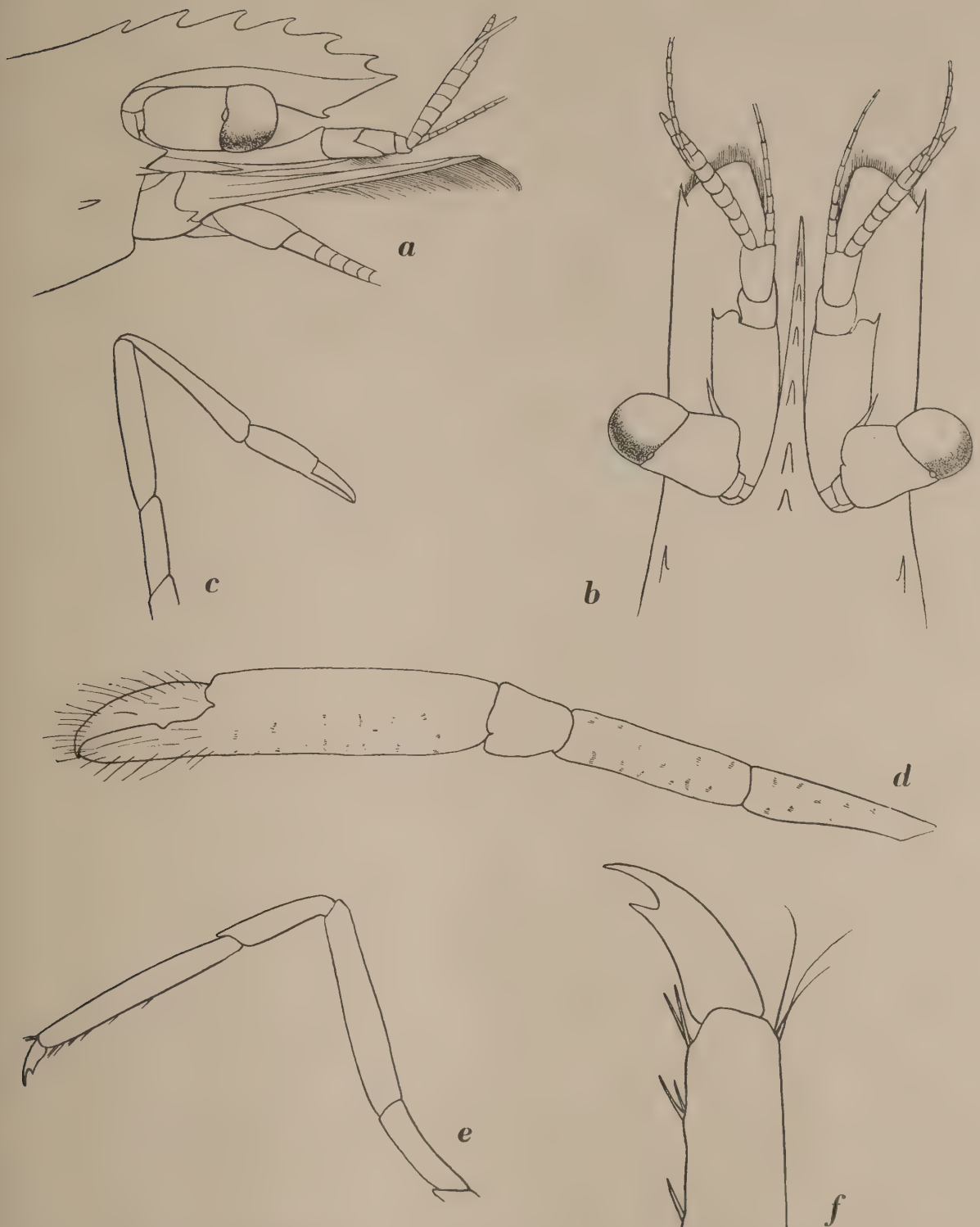


Fig. 9. *Periclimenes parvus* Borr. a, anterior part of body, lateral view; b, anterior part of body, dorsal view; c, first pereiopod; d, second pereiopod; e, third pereiopod; f, dactylus of third pereiopod. a-e, × 20; f, × 84.

abdominal segment is not produced in the posterior median part. The sixth segment is about one and a half time as long as the fifth.

The telson is longer than the sixth abdominal segment, the dorsal surface is provided with two pairs of spinules: the anterior pair is situated slightly behind the middle of the telson, the posterior pair is placed nearer to the anterior pair than to the posterior margin of the telson. This posterior margin bears three pairs of spinules, the outer of which is shortest, the intermediate longest.

The eyes are well developed, the cornea is as broad as the stalk.

The basal segment of the antennular peduncle is provided with a slender and pointed stylocerite, which reaches about the middle of the basal segment. The anterolateral angle of this segment bears a strong spine, which reaches beyond the middle of the second segment of the peduncle. The second segment is shorter than the third, together they are about half as long as the first. The upper antennular flagellum has the shorter ramus fused with the longer for about five segments; the free part of the shorter ramus is about $^2/_3$ of the length of the fused part.

The scaphocerite reaches distinctly beyond the antennular peduncle and the rostrum. The lamella is broad and reaches beyond the final tooth, the outer margin is straight. The antennal peduncle bears an exterior tooth.

The oral parts show much resemblance to those of *P. aesopius*. The mandible is figured here (fig. 10a). The upper lobe of the palp of the maxillula (fig. 10b) is rather indistinct and the epipod of the first maxilliped is larger and more distinctly cleft than in *P. aesopius*. The third maxilliped reaches the end of the antennal peduncle. The ultimate segment is shorter than the penultimate. The exopod reaches about to the end of the antepenultimate segment. In Borradaile's (1899) pl. 36 fig. 3c the ultimate segment of the third maxilliped is figured longer than the penultimate segment.

The first pereiopod (fig. 9c) reaches with the entire chela beyond the scaphocerite. (Borradaile states it to be shorter than the scaphocerite). The fingers are about as long as the palm. The carpus is about as long as the merus and somewhat longer than the chela. The second pereiopods (fig. 9d) are strong, and equal in shape; they reach with almost the entire chela beyond the scaphocerite. The fingers are half as long as the palm and are provided with many tufts of hairs. The dactylus has the cutting edge provided with one proximal tooth, which fits between two proximal teeth of the cutting edge of the fixed finger. The palm is cylindrical. The carpus is short, and less than half as long as the palm, it is conical in shape. The merus is slightly longer than the ischium. No spines are present on any of the joints; the ischium, the merus and the palm are rugose by numerous small inconspicuous tubercles, which are arranged in short transverse rows and bear short hairs; the carpus and the fingers are smooth or almost smooth. The third to fifth pereiopods are slender; the third (fig. 9e) reaches beyond the scaphocerite, the fifth fails to reach the end of that scale. The dactylus (fig. 9f) is slightly more than twice as long as its proximal breadth, it is biunguiculate, with two distinct claws. The propodus is about six times as long as the dactylus and has the posterior margin provided with spinules. The carpus measures $^1/_3$ of the length of the propodus and is slightly less than half as long as the merus.

The first pleopod of the male is figured here (fig. 10c). The endopod of this first pleopod differs from that of *P. impar* and *P. indicus* by lacking the distally directed tooth; at the place where *P. impar* shows this tooth the present species bears an irregular blunt protuberance, closely resembling thereby *Periclimenes soror*. The second pleopod resembles that of *Periclimenes impar*.

The uropods are longer than the telson. The exopod has the outer margin convex, naked, ending in a fixed and a movable tooth.

The differences between my specimen and Borradaile's description are:

1. In my specimen the last segment of the third maxilliped is shorter than the penultimate, whereas it is longer in Borradaile's figure.

Fig. 10. *Periclimenes parvus* Borr. a, mandible; b, maxillula; c, first pleopod of male. a, b, × 75; c, × 30.

2. The first pereiopods reach beyond the scaphocerite in my specimen, in Borradaile's specimen they fail to reach the end of that scale.

3. In my specimen the second legs outreach the scaphocerite with chela only; according to Borradaile's description in his specimen they outreach that scale with half the merus, in his figure, however, that statement is not confirmed as it shows the second pereiopod as long as in my specimen, or even slightly shorter.

These small differences are either due to variability of the species or to inaccuracy of Borradaile's description and figure. Borradaile's specimens measured 8.5 mm, being thereby considerably smaller than the specimen examined by me.

Distribution. This litoral form previously only has been recorded from Rakaiya, Blanche Bay, New Britain (Borradaile, 1898, 1899, 1917a; Kemp, 1922).

Periclimenes (*Periclimenes*) *hertwigi* Balss (figs. 11, 12)

Periclimenes hertwigi Balss, 1913, Zool. Anz., vol. 42, p. 235.
Periclimenes Hertwigi Balss, 1914, Abh. Bayer. Akad. Wiss., suppl. vol. 2 pt. 10, p. 49, textfigs. 28-30.
Periclimenes hertwigi Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser 2. vol. 17, p. 376.
Periclimenes hertwigi Kemp, 1922, Rec. Indian Mus., vol. 24, p. 138.
Periclimenes (*Ancylocaris*) *gracilirostris* Kubo, 1940, Journ. Imp. Fish. Inst., vol. 34, p. 41, figs. 8-10.

Siboga Expedition

Station 253, off Kai Islands, 5° 48'.2 S, 132° 13' E; trawl; depth 304 m; bottom grey clay, hard and crumbly; December 10, 1899. — 1 female 15 mm.

This species was regarded by Borradaile (1917a) as well as by Kemp (1922) to be of doubtful affinity; they thought it possible that it even should not belong to the Pontoniinae.

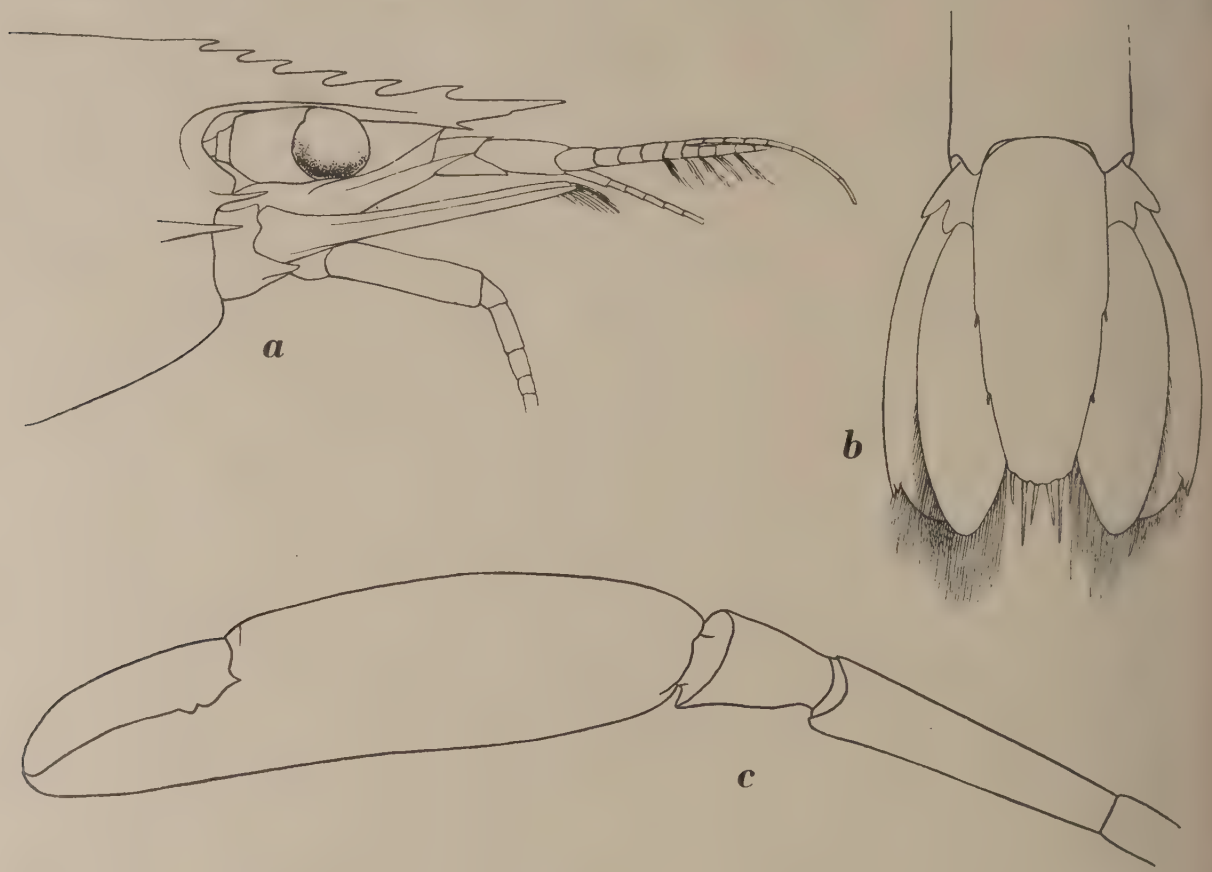


Fig. 11. *Periclimenes hertwigi* Balss. a, anterior part of body, lateral view; b, telson and uropods, dorsal view; c, second pereiopod. a-c, × 20.

Examination of the present specimen, which undoubtedly is identical with Balss's species, shows that it belongs to the Pontoniinae and even is a true *Periclimenes*. This will become clear from the following description:

The rostrum is slender, straight, anteriorly slightly curved upwards and almost reaching the end of the antennular peduncle. Dorsally it bears six teeth, the proximals of which are placed closer together than the distals. The first tooth is placed on the carapace behind the orbit, the second is situated just over the orbit. The lower margin of the rostrum bears two teeth, the proximal one in my specimen is placed below the distal dorsal tooth and is stronger than the second ventral tooth. In Balss's specimen the proximal ventral tooth is situated on a level between the ultimate and penultimate dorsal tooth. The lateral carina of the rostrum does not continue in the orbital margin,

but forms an indistinct ridge behind that margin. The carapace is smooth, provided with antennal and hepatic spines. The antennal spine is placed somewhat below the lower orbital angle. The hepatic spine is stronger than the antennal and placed on a lower level. It is situated slightly behind the antennal, but nevertheless very close to the anterior margin of the carapace. The anterolateral angle of the carapace is rounded.

The abdomen is smooth. The pleurae of the first three segments are rounded, those of the fourth and fifth segments are more triangular, but have the tip broadly rounded. The sixth abdominal segment is slightly less than twice as long as the fifth.

The telson (fig. 11b) is almost twice as long as the sixth abdominal segment and slightly less than thrice as long as broad. The dorsal surface is evenly convex, with two pairs of dorsal spinules placed close to the lateral margins. The anterior pair is situated in the middle of the telson, the posterior pair lies midway between the anterior pair and the posterior margin of the telson. This posterior margin is provided with the usual three pairs of spinules; the outer pair is short, the intermediate pair is longest, while the median pair is slightly shorter than the intermediate. In B a l s s's (1914) figure the telson is much broader (less than twice as long as broad) and has the broad posterior margin provided with 13 spinules. In all probability the telson in B a l s s's specimen is abnormal.

The eyes are well developed, failing largely to reach the end of the first segment of the antennular peduncle. The cornea is about as broad as, but distinctly shorter than the eyestalk.

The basal segment of the antennular peduncle has the stylocerite ovate and sharply pointed, directed forwards and reaching about to the middle of the basal segment. The anterolateral spine of that segment is strong and reaches almost the end of the second segment. The second segment is half as long as the third. Together they are about as long as the first. The upper antennular flagellum has the two rami fused for five segments (in B a l s s's specimen for 8 segments). The free part of the shorter ramus consists of about five segments and is half as long as the fused portion.

The scaphocerite reaches the end of the antennular peduncle (in B a l s s's specimen it does not reach so far). The outer margin is straight, slightly convex at base, ending in a strong spine, which reaches to or slightly beyond the lamella. The anterior margin of the lamella is broadly rounded. The basal part of the antennal peduncle is provided with a strong outer spine. The antennal peduncle reaches the end of the second segment of the antennular peduncle.

The oral parts are typical. The mandible (fig. 12c), however, bears no brushlike arranged spinules on the molar process. The palp of the maxillula (fig. 12d) is deeply cleft. The caridean lobe at the base of the exopod of the first maxilliped (fig. 12e) is narrow, the palp of the maxilliped is slender. The third maxilliped reaches the end of the basal segment of the antennular peduncle. The last segment is slightly shorter than the penultimate. The antepenultimate segment is about twice as long as the ultimate. The exopod reaches slightly beyond the antepenultimate segment.

The first pereiopod is slender and reaches with the entire chela and the carpus beyond the scaphocerite. The fingers are about as long as the palm, provided with tufts of setae and with the cutting edges entire (only some minute serrations may be observed near the tips). The carpus is somewhat longer than the chela; the merus is slightly longer than the carpus; the ischium is about half as long as the merus. The second pereiopods (fig. 11c) are equal, stronger than the first and reaching with the carpus and the chela beyond the scaphocerite. The fingers measure about half the length of the palm; the dactylus has the cutting edge provided near the base with one ventral tooth,

the fixed finger bears two teeth there; the rest of the cutting edges is entire. The palm is cylindrical and as broad as the two fingers together. The carpus measures about $^1/_3$ of the length of the palm, it is triangular and unarmed. The merus is distinctly shorter than the palm and unarmed too. The ischium is about $^3/_4$ as long as the merus. The third pereiopod reaches with the entire propodus beyond the antennal scale. The dactylus is slender and ends in a curved point. The lower margin is provided with an excavation behind the tip, which gives the dactylus its bifid appearance. When strongly magnified the distal part of the dactylus shows a curious shape: at the place, where in other species the second claw is situated, here the posterior margin of the dactylus shows some shallow lobes, which are hardly visible because the margin of the dactylus is very thin there. In the excavation behind the

Fig. 12. *Periclimenes hertwigi* Balss. a, fourth pereiopod; b, tip of dactylus of fourth pereiopod; c, mandible; d, maxillula; e, first maxilliped a, × 20; b, × 400; c-e, × 50.

apex a row of denticles or very short hairs are situated, the real nature of which could not be observed with certainty by me, but which I have tried to figure as good as possible (fig. 12b). The propodus is slender, almost five times as long as the dactylus and about 10 times as long as broad, the posterior margin is provided with some spinules. The carpus is about half as long as the propodus. The merus is as long as the propodus, but distinctly broader; it is unarmed. The last two pereiopods are similarly built as the third (fig. 12a).

The uropods (fig. 11b) are distinctly longer than the telson; they are more slender than figured by Balss. The outer margin of the exopod is convex and ends into two spines.

The present specimen agrees with the description and figure given by Balss (1914) in all details, except for the longer scaphocerite and for the shape of the tail fan. The length of the scaphocerite may be variable; the tailfan in Balss's specimen probably is, as already pointed out above, abnormal.

Very characteristic for the present species is the shape of the dactyli of the last three pereiopods, in which feature it differs as far as I know from all other species of the genus *Periclimenes* or of one of the allied genera.

Kubo's (1940) *Periclimenes gracilirostris* evidently is based on a specimen of *Periclimenes hertwigi,* as it agrees with the present species in all respects. Kubo himself already pointed to the close resemblance of the two forms, but thought the fact that Balss's type specimen had the posterior margin of the telson provided with 13 spines of enough importance to consider his own specimen as belonging to a different species.

Vertical distribution. Balss's specimen was collected at a depth of 120 m, that of Kubo at 305 m, and the specimen of the Siboga Expedition at a depth of 304 m. Balss's specimen was found between the spines of a species of *Phormosoma.*

Horizontal distribution. The records in literature are: Boshu and Kagoshima, Sagami Bay, Japan (Balss, 1913, 1914), off Kumano-nada, Mie prefecture, Honshu, Japan (Kubo, 1940). The present record from the Kai Islands thus considerably extends the known range of distribution of the species.

Periclimenes (*Periclimenes*) *latipollex* Kemp (figs. 13, 14)

Periclimenes (*Periclimenes*) *latipollex* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 150, textfig. 18, pl. 4 fig. 3.

Siboga Expedition

Station 253, off Kai Islands, 5° 48'.2 S, 132° 13' E; trawl; depth 304 m; bottom grey clay, hard and crumbly; December 10, 1899. — 2 specimens (one of which an ovigerous female) 18 and 21 mm.

My specimens differ from Kemp's description only in the slightly higher rostrum (fig. 13), which is provided with 2 ventral and 7 or 8 dorsal teeth, two or three of which are placed on the carapace. The rostrum reaches slightly beyond the scaphocerite. Furthermore Kemp states the

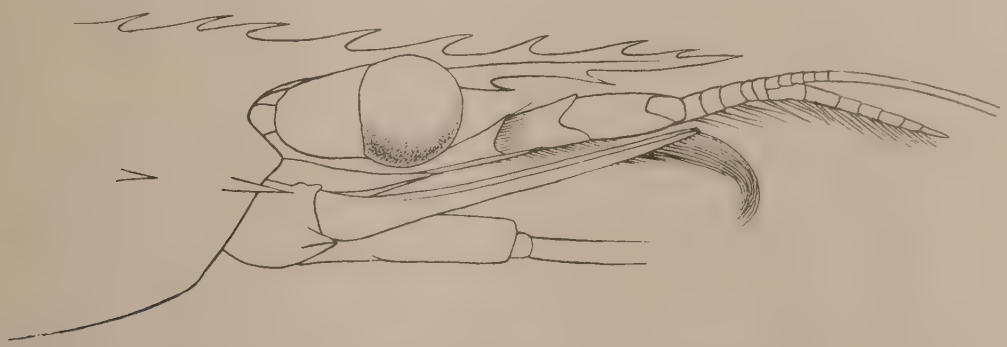


Fig. 13. *Periclimenes latipollex* Kemp. Anterior part of body, lateral view. × 20.

carpus of the first pereiopod to be shorter than the chela, whereas in my specimens it is slightly longer.

The accessory claw of the dactylus is so small that it easily may escape notice; when preliminary identifying the specimens I referred them to the subgenus *Harpilius,* but examination with a microscope revealed the existence of the second claw.

The oral parts are typical (figs. 14a, b), showing no essential differences from those of *P. aesopius.*

The endopod of the first pleopod (fig. 14c) of the male is rather broad and like in *P. impar* and *P. indicus* it bears a broad distally directed tooth at the end of the inner margin.

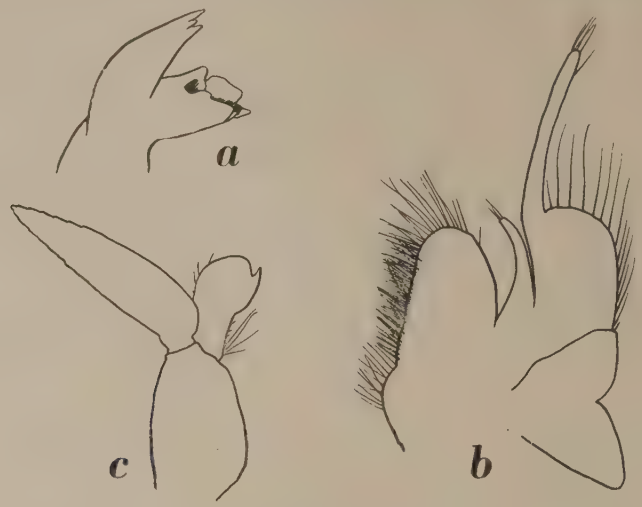


Fig. 14. *Periclimenes latipollex* Kemp. a, mandible; b, first maxilliped; c, first pleopod of male. a, × 50; b, × 40; c, × 20.

Vertical distribution. Kemp's specimens were obtained from a depth of 112 m, those of the Siboga Expedition from 304 m.

Horizontal distribution. The only previous record is from the Mergui Archipelago, 12° 15'.3 N, 97° 10'.2 E (Kemp, 1922).

Periclimenes (*Periclimenes*) *pectiniferus* nov. spec. (figs. 15, 16)

Siboga Expedition

Station 79b, Kabala dua Island, Borneo Bank; reef; depth 22 m; June 12 and 13, 1899. — 2 ovigerous females 13 and 16 mm.

The rostrum is strong, reaching beyond the antennular peduncle and almost extending as far as the end of the scaphocerite. It is directed downward, only the tip is somewhat curved upward. The dorsal margin bears nine teeth, one or two of which are placed on the carapace behind the orbit. The lower margin is provided with one single tooth near the apex. The lateral carina of the rostrum posteriorly continues in the orbital margin. The carapace is smooth and provided at each side with an antennal as well as with a hepatic spine. The antennal spine is placed below the rather acute lower orbital angle; the hepatic spine is situated behind the antennal on a lower level. The antero-lateral angle of the carapace is rounded.

The abdomen is smooth, the pleurae of the first three segments are broadly rounded, those of the fourth and fifth are narrower, but the tip is rounded too. The sixth abdominal segment is one and a half times as long as the fifth.

The telson is about one and a half times as long as the sixth abdominal segment. The dorsal

surface is provided with two pairs of spinules: the anterior pair is situated in the middle of the telson, the posterior midway between the anterior pair and the posterior margin of the telson. This margin is provided with three pairs of spinules, the outer pair being shortest, the intermediate longest.

The eyes have the cornea broader than the stalk, the ocellus, which is fused with the cornea, is distinct.

The basal segment of the antennular peduncle is broad, the stylocerite is sharply pointed and reaches about the middle of the segment; the anterolateral angle of the segment ends in a strong spine, which reaches beyond the middle of the second segment; the anterior margin of the first segment runs straight inward from the anterolateral spine and near the peduncle it abruptly curves posteriorly. The third segment is narrower and longer than the second, together the two segments are somewhat longer than half the basal segment. The two rami of the upper flagellum are fused for four segments, the free part of the shorter ramus is slightly shorter than the fused portion.

The scaphocerite reaches distinctly beyond the antennular peduncle, it is slightly narrower at the tip than in the middle, being about thrice as long as the greatest width. The final tooth is strong and nearly reaches the end of the lamella. The anterior inner angle of the lamella is rather acute. The antennal peduncle bears a distinct spine.

The oral parts are quite typical (figs. 16a, b); the palp of the maxillula is uncleft; the upper lobe of the inner lacinia of the maxilla is slightly broader than the lower; the first maxilliped resembles that of *P. impar,* it only has the palp slightly longer. The third maxilliped reaches the end of the antennal peduncle. The ultimate segment is about $^3/_4$ of the length of the penultimate. The antepenultimate segment is longest and distinctly curved. The exopod fails to reach the end of the antepenultimate segment.

The first pereiopod (fig. 15c) is slender, it reaches with the entire chela and a small part of the carpus beyond the scaphocerite. The fingers are as long as the palm, they are broad with the outer margin curved and with the cutting edge provided with a fine pectination on the larger part of its length. The palm is less than twice as long as broad. The carpus is about as long as the merus and about one and a half times as long as the chela, it is broad anteriorly and narrows posteriorly. The ischium is about half as long as the merus. The second pereiopods (fig. 15d) are strong, equal, they reach with almost the entire chela beyond the scaphocerite. The fingers are shorter than the palm, being almost $^2/_3$ of its length. The cutting edges bear no teeth at all. The carpus is about as long as the dactylus, the anterior margin bears no teeth; the shape of the carpus is conical with the narrower part posteriorly. The merus and the ischium are of about the same length, being slightly shorter than the palm; they are not provided with ventral spines. The third pereiopod (fig. 15f) reaches slightly beyond the scaphocerite. The dactylus (fig. 15e) is short, measuring $^1/_6$ of the length of the propodus; it is narrower than the distal part of the propodus; its posterior margin is provided with a small accessory spine behind the final tooth. The propodus is slightly broader distally than proximally; its posterior margin is provided with spinules, in its distal part some tufts of setae are present. The carpus is about half as long as the propodus. The merus is about as long as the propodus and twice as long as the ischium. The fourth and fifth pereiopods are similarly built as the third.

The uropods are longer than the telson. The outer margin of the exopod is slightly convex, naked and ends into two spines, the inner of which is movable. The endopod is shorter than the exopod.

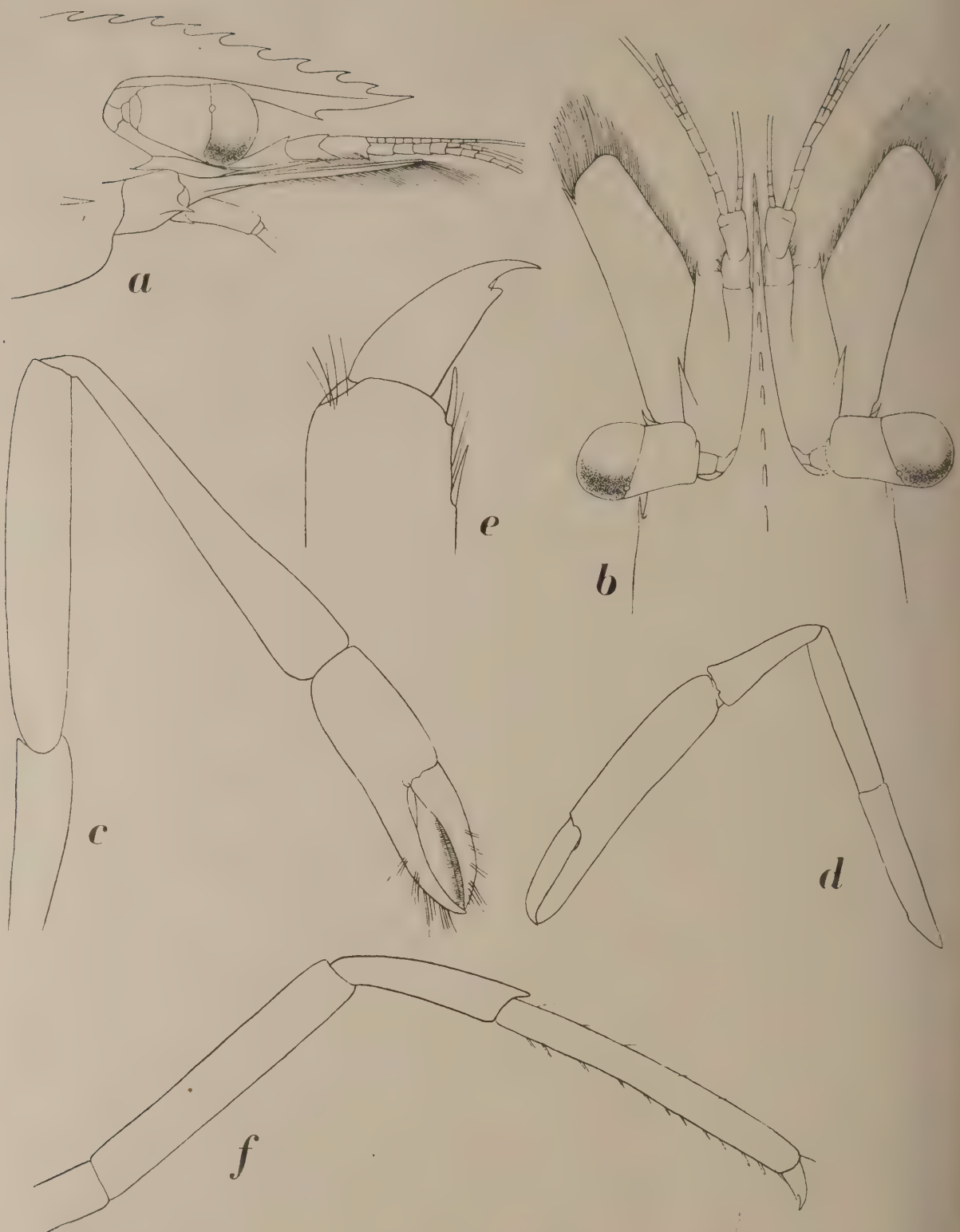


Fig 15. *Periclimenes pectiniferus* nov. spec. a, anterior part of body, lateral view; b, anterior part of body, dorsal view; c, first pereiopod; d, second pereiopod; e, dactylus of third pereiopod; f, third pereiopod. a, b, d, × 17; c, × 47; e, × 170; f, × 35.

The present species is most closely related to *Periclimenes soror* Nobili and *P. noverca* Kemp; together with these two species it forms the group of the subgenus *Periclimenes*, in which the fingers of the first pereiopod are pectinate. From *Periclimenes noverca* the new species differs by having the merus of the last three pereiopods without an anteroventral spine, by having one or two of the dorsal teeth of the rostrum situated behind the posterior margin of the orbit and by the more slender first pereiopods. In *P. soror* our species finds its nearest relative. The differences between the two

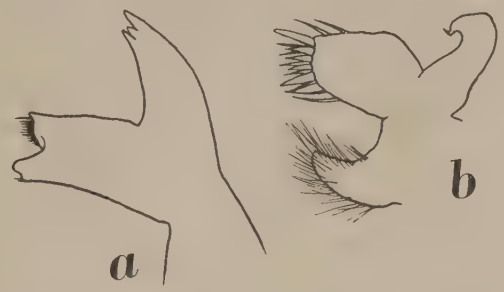


Fig. 16. *Periclimenes pectiniferus* nov. spec. a, mandible; b, maxillula. a, b, × 60.

species are: The dorsal teeth of the rostrum in *P. soror* all are placed on the rostrum proper, while in our species at least one tooth is situated on the carapace. *P. pectiniferus* has 9 dorsal teeth on the rostrum, *P. soror* 11-13; the ventral margin of the rostrum in *P. soror* is entire, while in *P. pectiniferus* one tooth is present there. The basal segment of the antennular peduncle in *P. soror* is provided with two or three anterolateral teeth, only one such tooth is present in *P. pectiniferus*. The first legs are shorter in *P. soror* and do not reach beyond the scaphocerite. The fingers of the second legs in *P. soror* measure about $^1/_3$ of the length of the palm, while in *P. pectiniferus* they are about $^2/_3$ of the length of the palm.

Periclimenes (*Periclimenes*) *soror* Nobili (fig. 17)

Periclimenes soror Nobili, 1904, Bull. Mus. Hist. nat. Paris, vol. 10, p. 232.
Periclimenes soror Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 50, pl. 2 fig. 6.
? *Periclimenes* (*Cristiger*) *frater* Borradaile, 1915, Ann. Mag. nat. Hist., ser. 8 vol. 15, p. 210.
Periclimenes (*Cristiger*) *soror* Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 363.
? *Periclimenes* (*Cristiger*) *frater* Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, pp. 324, 364, pl. 53 fig. 6.
Periclimenes (*Periclimenes*) *soror* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 165.
Periclimenes bicolor Edmondson, 1935, Occ. Pap. Bishop Mus., vol. 10 pt. 24, p. 10, fig. 3.
Periclimenes soror Gordon, 1939, Ann. Mag. nat. Hist., ser. 11 vol. 4, p. 395, figs. 1-3.

Snellius Expedition

Sipankot, near Sibutu, Sulu Islands; between seagrass near the shore; September 11, 1929. — 3 specimens (1 ovigerous female) 8-12 mm.

Gordon (1939) gave an extensive description of the present species, with figures of various parts of the body. This description largely extends our knowledge of the species, the more as the type specimens could be examined by the English author.

Some of the oral parts of this species are rather aberrant. The mandible (fig. 17a) has both incisor and molar process slender; between the two lateral teeth of the incisor process numerous

(about 8) small denticles are present, the inner margin of the process bears a distinct denticle close to the inner lateral tooth. The molar process is more or less cylindrical and bears no knobs or ridges, it is provided in the distal part with a crown of spines. The maxillula (fig. 17b) is rather typical; the palp shows only a faint trace of the upper lobe. The maxilla (fig. 17c) has the palp short and broad, the scaphognathite is rather wide, the inner lacinia is composed of two short and rather broad lobes, the lower lobe being shorter and narrower than the upper. The maxillipeds are quite typical; the caridean lobe of the exopod of the first maxilliped (fig. 17d) is rather broad.

Gordon (1939, fig. 2b) figures the first pleopod of the male of the present species; the endopod of this pleopod shows remarkably much resemblance to that of *P. parvus*.

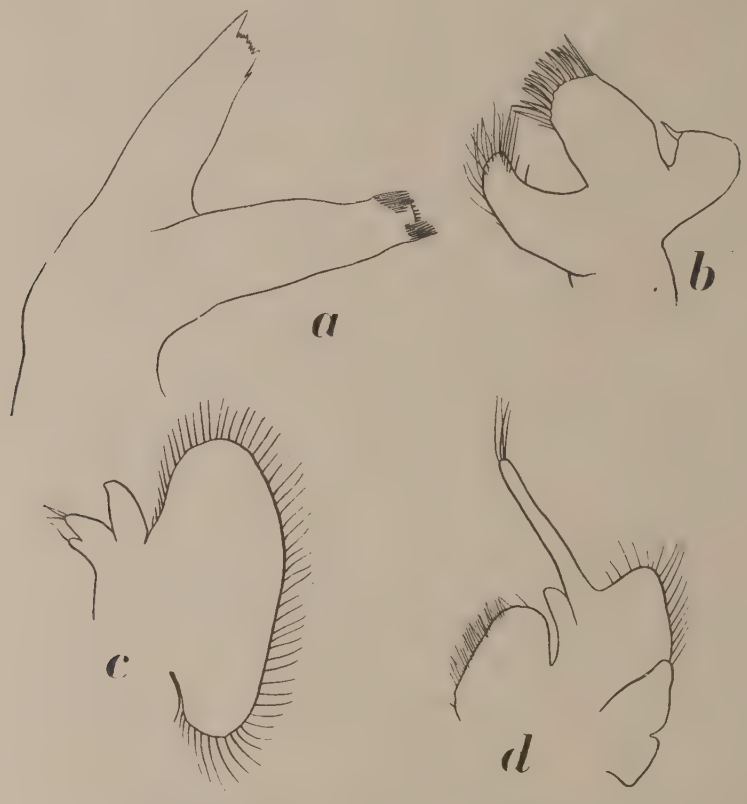


Fig. 17. *Periclimenes soror* Nobili. a, mandible; b, maxillula; c, maxilla; d, first maxilliped. a, × 240; b, × 120; c, d, × 60.

According to Borradaile (1917) his *Periclimenes frater* differs from *P. soror* in the following four characters:

1. "The teeth on the upper edge of the rostrum [in *P. frater*] are closer set towards the tip than near the base".
2. "there are two distal spines on the first joint of the antennule".
3. "the antennal scale decidedly outreaches the first leg".
4. "there is no accessory denticle on the dactylopodites of the last three legs".

Comparison with Gordon's (1939) description makes it clear that the first three points are no differences at all, as these characters, which Borradaile thinks to be specific for *P. frater* also

are present in *P. soror* (even in the syntypes examined by Gordon), the proximal teeth of the dorsal margin of the rostrum are wider spaced than the distals, the basal segment of the antennular peduncle has two or three anterolateral spines and the first pereiopods do not reach the end of the scaphocerite. The only remaining difference being the uniunguiculate dactylus of the last three legs in *P. frater* and the biunguiculate in *P. soror*. The accessory spine on the dactylus, as shown by Gordon's figure is very inconspicuous and easily may escape notice. I think it therefore very well possible that *P. soror* and *P. frater* are identical, but confirmation by means of the examination of Borradaile's type is needed. *P. bicolor* Edmondson no doubt is identical with the present species, which becomes clear, when comparing Edmondson's description and figures with those of Gordon.

Vertical distribution. The species is a litoral form and lives in association with Asteroids: Edmondson records it in association with *Linckia multifora* (Lam.), Gordon reports it from *Protoreaster nodosus* (L.).

Horizontal distribution. The species is recorded from: Jibuti (Nobili, 1904, 1906b), Sanur, southcoast of Bali (Gordon, 1939), Kaneohe Bay, Oahu, Hawaiian Archipelago (Edmondson, 1935). *Periclimenes frater* Borr. was collected at Egmont Reef, Seychelles (Borradaile, 1915, 1917a).

Periclimenes (*Periclimenes*) *commensalis* Borradaile (figs. 18, 19)

Periclimenes (*Cristiger*) *commensalis* Borradaile, 1915, Ann. Mag. nat. Hist., ser. 8 vol. 15, p. 211.
Periclimenes commensalis Potts, 1915, Pap. Dept. mar. Biol. Carnegie Inst., vol. 8, p. 82.
Periclimenes (*Cristiger*) *commensalis* Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 364.
Periclimenes (*Periclimenes*) *commensalis* Clark, 1921, Bull. U. S. Nat. Mus., vol. 82 pt. 2, p. 628.
Periclimenes (*Periclimenes*) *commensalis* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 166.

Siboga Expedition

Station 50, Bay of Badjo; westcoast of Flores; dredge, trawl and shore exploration; depth up to 40 m; bottom mud, sand and shells, according to locality; April 16-18, 1899. — 1 ovigerous female 10 mm.

My specimen agrees in all important characters with Borradaile's description. The rostrum is rather high, directed slightly downward, reaching a little beyond the antennular peduncle, but failing to reach the end of the scaphocerite. The upper margin is provided with 6 (in Borradaile's specimen with 5) teeth, which all are placed on the rostrum proper. The lower margin bears two teeth, which are situated below the fourth and fifth dorsal tooth respectively. The carapace is smooth, provided with supraorbital, antennal and hepatic spines. The supraorbital spine is well developed; the antennal spine is placed below the slightly produced and narrowly rounded lower orbital angle; the hepatic spine, which is stronger than the antennal is placed behind it and on a lower level. The anterolateral angle of the carapace is rectangularly rounded.

The abdomen is smooth. The pleurae of the first five segments are rounded, those of the fourth and fifth segments are rather narrow. The third segment is not produced in the median part of the posterior margin. The sixth segment is almost one and a half times as long as the fifth.

The telson is slightly less than one and a half times as long as the sixth abdominal segment.

The dorsal surface of the telson is provided with two pairs of minute spinules, the first of which lies somewhat behind the middle of the telson, the second about midway between the first pair and the posterior margin of the telson. This posterior margin is provided with three pairs of spinules, the outer of which is very short, the intermediate is longest and the median pair is about half as long as the intermediate.

The eyes are well developed and reach almost to the end of the basal segment of the antennular peduncle. The cornea is hemispherical and about as broad as, but distinctly shorter than the eyestalk. The ocellus is small but distinct.

The basal segment of the antennular peduncle is broad and has the stylocerite small and sharply pointed, it reaches almost the middle of the basal segment. The outer anterolateral angle of the basal segment ends in a strong spine; the anterior margin of the segment is produced forward into a sharp point, which reaches beyond the middle of the second segment of the antennular peduncle; the basal segment therefore appears to end into two distal spines. The second segment is shorter than the third, together they are more than half as long as the first segment. The upper antennular flagellum has the two rami fused for only three joints in my specimen.

The scaphocerite reaches distinctly beyond the antennular peduncle. The outer margin is slightly convex, ending in a strong tooth. The lamella is broad and reaches distinctly beyond the final tooth. The basal part of the antennal peduncle is provided with an outwards directed tooth; the last segment of the peduncle fails to reach the middle of the scaphocerite.

The oral parts show much resemblance to those of *P. aesopius*. The incisor process of the mandible (fig. 19a) in my specimen bears five teeth at the distal margin. The upper lobe of the palp of the maxillula (fig. 19b) is feebly developed. There is a notch between the basis and the coxa of the first maxilliped. The third maxilliped reaches the end of the antennal peduncle. The last segment measures $^3/_4$ of the penultimate segment. The antepenultimate is one and a half times as long as the penultimate, it is distinctly curved. The exopod reaches beyond the articulation between the antepenultimate and the penultimate segments.

The first pereiopod (fig. 18c) is slender and reaches with the fingers beyond the end of the scaphocerite. The fingers are about as long as the palm and unarmed. The carpus is distinctly longer than the chela. The merus is about as long as the carpus. The ischium is about half as long as the merus. The second pereiopods both are lacking in my specimen. The third pereiopod (fig. 18e) reaches slightly beyond the scaphocerite. The dactylus (fig. 18d) is curved and biunguiculate; the upper margin of the dactylus is provided with a movable spine. The propodus is about 5 times as long as the dactylus, it is provided with some scattered hairs, and bears some minute spinules along the posterior margin; near the base of the dactylus some serrate spines are present. The carpus is about half as long as the propodus. The ischium is more than half as long as the merus. The last two pereiopods are similarly built as the third.

The uropods are longer than the telson. The outer margin of the exopod is slightly convex and ends into two spines.

The present specimen entirely agrees with Borradaile's description and I do not hesitate to refer it to this very characteristic species, though the second pereiopods are lacking. About the type specimen of *Periclimenes commensalis* Kemp (1922) gives the following remark: "I have examined the type of this species and think that Borradaile is mistaken in stating that there are

two spines at the distal end of the basal antennular segment. The margin between the outer spine

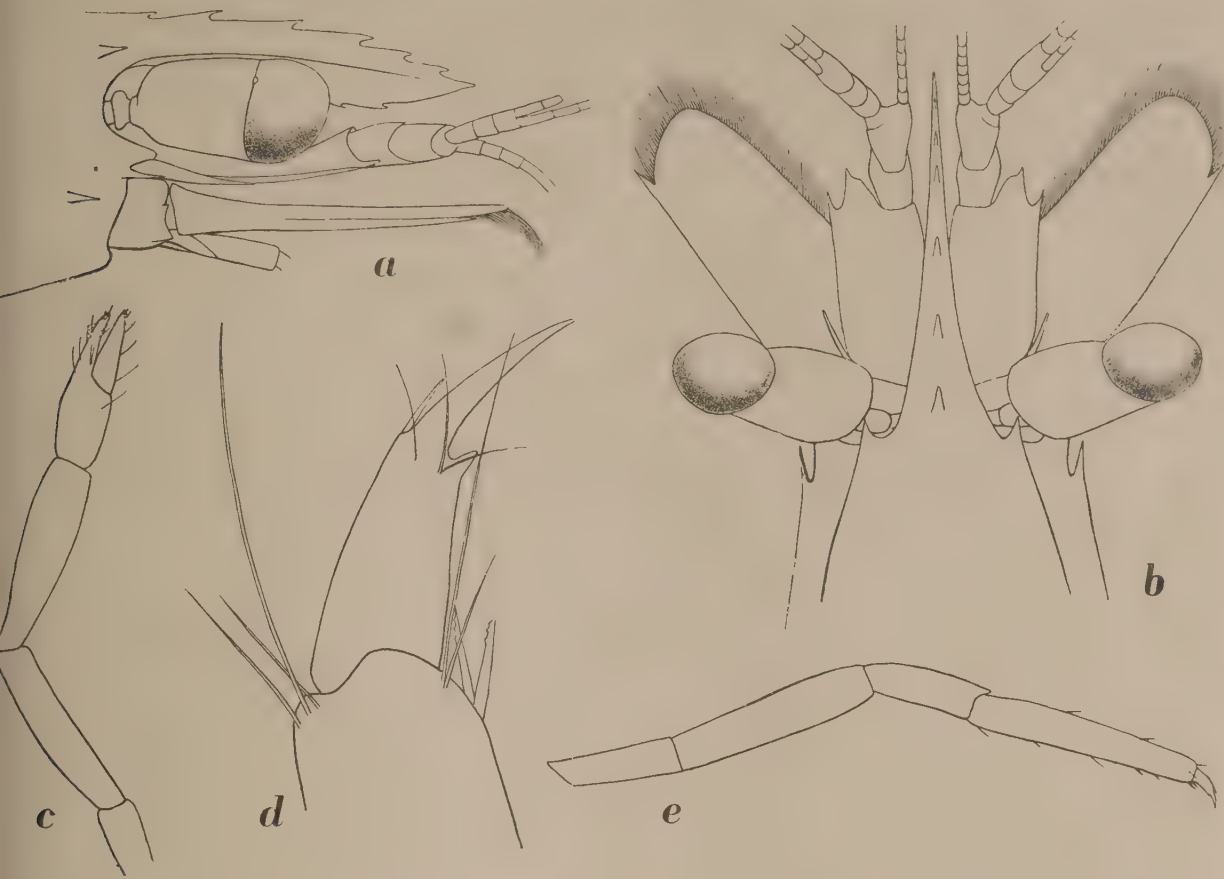


Fig. 18. *Periclimenes commensalis* Borr. a, anterior part of body, lateral view; b, anterior part of body, dorsal view; c, first pereiopod; d, dactylus of third pereiopod; e, third pereiopod. a-c, e, × 27; d, × 130.

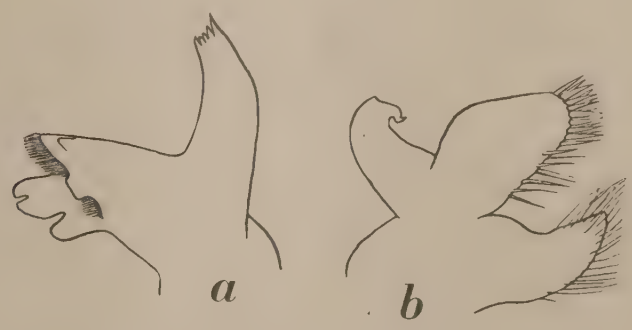


Fig. 19. *Periclimenes commensalis* Borr. a, mandible; b, maxillula. a, b, × 75.

and the articulation of the second segment is somewhat more produced than usual, but is rounded and does not end in a spine." In my specimen, just like described in Borradaile's description and in contradiction with Kemp's statement, the anterior margin of the first segment of the

antennular segment between the outer spine and the articulation with the second segment is produced into a distinct tooth.

Vertical distribution. The species is a litoral form. Borradaile's specimen was found on the Crinoid *Comanthus timorensis* (J. Müller) (= *C. annulatum* (Bell)), a species of which a specimen was collected also by the Siboga Expedition from the same locality as the present specimen of *Periclimenes commensalis*.

Horizontal distribution. The type of the species, the only specimen known up till now, was collected at Murray Island, Torres Straits. The species is new for the Malay Archipelago.

Periclimenes (*Periclimenes*) *ceratophthalmus* Borradaile (fig. 20)

Periclimenes (*Corniger*) *ceratophthalmus* Borradaile, 1915, Ann. Mag. nat. Hist., ser. 8 vol. 15, p. 211.
Periclimenes (*Corniger*) *ceratophthalmus* Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, pp. 324, 365, pl. 54 fig. 9.
Periclimenes (*Laomenes*) *ceratophthalmus* Clark, 1921, Bull. U. S. Nat. Mus., vol. 82 pt. 2, p. 629.
Periclimenes (*Ancylocaris*) *ceratophthalmus* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 172.
Periclimenes (*Periclimenes*) *ceratophthalmus* Kemp, 1925, Rec. Indian Mus., vol. 27, p. 324, fig. 18.

Snellius Expedition

Obi latu; shore and reef; April 27, 1930. — 1 ovigerous female 13 mm.

In my specimen the rostrum reaches slightly beyond the antennular peduncle and is outreached by the scaphocerite; it bears, as in Kemp's (1925) specimen, 5 teeth at the upper margin; the ultimate, however, is small and placed close to the apex. The first leg as in Kemp's specimen

Fig. 20. *Periclimenes ceratophthalmus* Borr. a, mandible; b, maxillula. a, b, × 75.

outreaches the scaphocerite by more than its chela. The relation between the joints also is as indicated by Kemp and differs from Borradaile's description. The dactylus and the fixed finger of the second leg each bear three shallow teeth on the cutting edge. The situation of the hepatic spine and the shape of the cornea are entirely similar to those in Kemp's specimen. A character of the present species, which is mentioned neither by Borradaile (1917a) or by Kemp (1925) is the fact that the two pairs of spinules on the dorsal surface of the telson are extremely small and placed close to the lateral margins. The anterior pair as in most species of the present genus is placed in the middle of the telson, the posterior pair midway between it and the posterior margin.

The mandible (fig. 20a) is aberrant in the shape of the incisor process, this process namely widens distally; the distal margin of the incisor process bears about 9 teeth, the outer of which is

very broad. The rest of the oral parts is quite typical. The upper lobe of the palp of the maxillula (fig. 20b) is small. The epipod of the first maxilliped is more distinctly bilobed than in *P. aesopius*.

Vertical distribution. The species is a litoral form. Both specimens recorded in literature were found in association with Crinoids.

Horizontal distribution. Records in literature are: Hulule, Male Atoll, Maldive Archipelago (Borradaile, 1915, 1917a), West of Heratera Island, Maldive Archipelago (Kemp, 1925). The present record from the Malay Archipelago forms a considerable extension of the known range of distribution of the species.

Subgenus **Harpilius** Dana

The present subgenus, which is characterized by the possession of simple dactyli at the last three pereiopods, is named by Kemp (1922) *Ancylocaris*. As however the type species of the genus *Harpilius, H. lutescens,* is included here in the present subgenus, the name *Harpilius* Dana, 1852 becomes a synonym of *Ancylocaris* Schenkel, 1902; as Dana's name is older it must be used.

The oral parts in the present subgenus show the closest resemblance to those of the preceding.

Fig. 21. *Periclimenes americanus* Kingsley ♂. a, first pleopod; b, second pleopod. a, b, × 42.

The shape of most parts, however, is more constant than in *Periclimenes* s.s. The incisor process of the mandible in my specimens of *Harpilius* for instance almost always ends in 3 (seldom 4 or 5) teeth. The molar process mostly bears brush-like arranged spinules, these spinules are absent in *P. nilandensis* and *P. seychellensis,* in other species they are few in number. The upper lobe of the palp of the maxillula varies in size, in *P. nilandensis* it is well developed, in *P. lutescens* it is much less distinct. The inner lacinia of the maxillula is rather slender. The maxilla shows no difference with that of *Periclimenes* s.s.; the maxillipeds too are closely similar to those of the preceding subgenus.

The shape of the endopod of the first pleopod of the male is, as far as I could control, rather uniform in the species of the present subgenus; the endopod namely is oval in shape and broadened near the apex, the inner margin is more or less distinctly concave. In none of the specimens of *Harpilius,* which I examined a tooth or irregular protuberance is present in the distal part of the inner margin of the endopod. For comparison with the other species, figures of the first two pleopods of *P. americanus* are given here (figs. 21a, b).

The present subgenus, the larger of the two subgenera forming the genus *Periclimenes,* is

represented in the collections at hand by 18 species, 4 of which are new to science. 19 species of this subgenus are known from Indonesia; three of these species could not be examined by me.

Periclimenes (*Harpilius*) *nilandensis* Borradaile (fig. 22)

Periclimenes (*Falciger*) *nilandensis* Borradaile, 1915, Ann. Mag. nat. Hist., ser. 8 vol. 15, p. 211.
Periclimenes (*Falciger*) *nilandensis* Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, pp. 324, 372, pl. 54 fig. 13.
Periclimenes (*Ancylocaris*) *nilandensis* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 172.

Siboga Expedition

Station 47, Bay of Bima, Sumbawa; trawl, dredge and shore exploration; depth up to 55 m; bottom mud with patches of fine coral sand; April 8-12, 1899. — 1 ovigerous female 16 mm.
Station 50, Bay of Badjo, westcoast of Flores; dredge, trawl and shore exploration; depth up to 40 m; bottom mud, sand and shells, according to locality; April 16-18, 1899. — 1 ovigerous female 11 mm.
Station 144, anchorage north of Salomake (= Damar) Island; dredge, townet and reef exploration; depth 45 m; coralbottom and lithothamnion; August 7-9, 1899. — 1 ovigerous female 15 mm.

The rostrum is rather broad and has the ultimate portion curved upward, it reaches to or beyond the scaphocerite. The dorsal margin is provided with 8 or 9 teeth, the proximal two of which are placed on the carapace behind the orbit, the ultimate tooth is situated close to the apex of the rostrum. The lower margin bears 3 or 4 teeth. Between the dorsal teeth and laterally of the ventral ones plumose setae are present. The lateral surface of the rostrum bears a longitudinal carina, which starts at the orbital margin and becomes weaker towards the tip of the rostrum. The carapace is smooth, provided with supraorbital, antennal and hepatic spines. The supraorbital spine is distinct and placed below the second tooth of the rostrum, it is situated more behind than above the orbit. The antennal spine is stronger than the supraorbital, it is placed below the acute lower orbital angle. The hepatic spine even is stronger than the antennal and is placed obliquely behind it on a lower level. The anterolateral angle of the carapace is rounded.

The abdominal segments are smooth. The pleurae of the first three segments are broadly rounded, those of the fourth segment are narrower but also rounded, while the pleurae of the fifth segment end in an acute posteriorly directed point. The posterior margin of the third segment is broadly produced in the middle, thereby somewhat overlapping the fourth segment. The sixth abdominal segment is about one and a half times as long as the fifth.

The telson is one and a half times as long as the sixth abdominal segment. Dorsally it bears two pairs of spinules; the anterior pair is situated before the middle of the telson, the posterior pair midway between the anterior pair and the posterior margin of the telson. This posterior margin bears three pairs of spinules, the outer pair is very short, the intermediate longest (about six times as long as the outer pair), the inner pair is slightly less than half as long as the intermediate pair.

The eyes are well developed. The cornea is hemispherical and about as broad as, but distinctly shorter than the stalk. The ocellus is rather inconspicuous. Two lines of black pigment are visible on the cornea.

The first segment of the antennula is broad, with a distinct, sharply pointed stylocerite, which just fails to reach the middle of the segment. The anterolateral angle of the basal segment of the

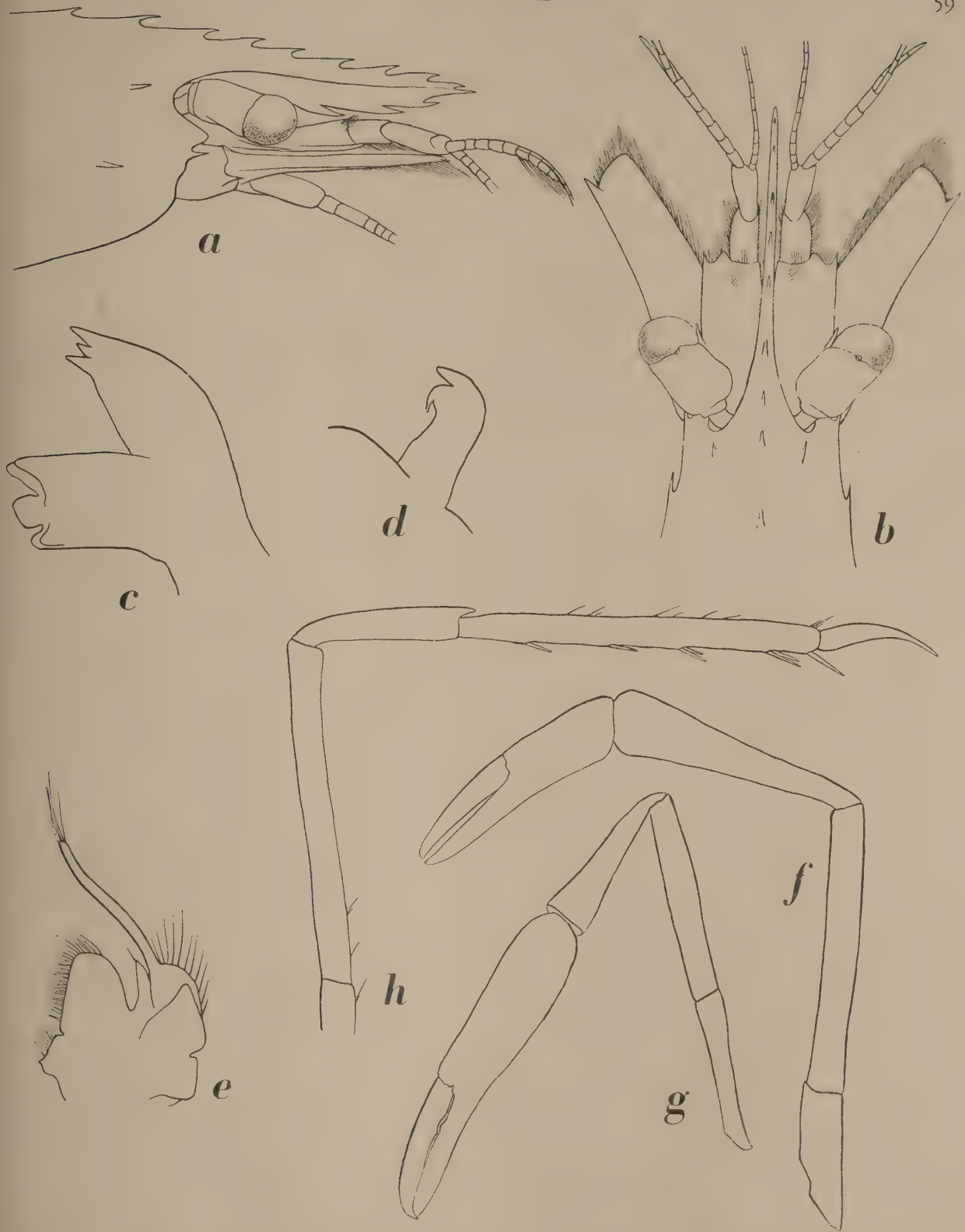


Fig. 22. *Periclimenes nilandensis* Borr. a, anterior part of body, lateral view; b, anterior part of body, dorsal view; c, mandible; d, palp of maxillula; e, first maxilliped; f, first pereiopod; g, second pereiopod; h, third pereiopod. a, b, g, × 18; c, d, × 86; e, f, h, × 36.

antennula bears a strong spine, which does not extend as far as the middle of the second segment of the peduncle. The anterior margin of the basal segment is strongly convex. The second segment is broader than and about as long as the third segment. The first five or six segments of the two rami of the upper antennular flagellum are fused; the free part of the shorter ramus is about $^2/_3$ of the length of the fused portion.

The scaphocerite is broad and reaches slightly beyond the antennular peduncle. The anterior margin of the lamella is rounded. The outer margin of the scaphocerite is straight or slightly concave. it ends in a strong tooth which reaches to or slightly beyond the end of the lamella. The antennal peduncle is provided with a distinct tooth.

The oral parts offer no striking features. The molar process of the mandible (fig. 22c) bears no spines. The palp of the maxillula (fig. 22d) is deeply cleft. The coxa of the first maxilliped (fig. 22e) ends in a lateral tooth. The third maxilliped reaches distinctly beyond the antennal peduncle. The ultimate segment measures about $^2/_3$ of the penultimate, which is slightly shorter than the antepenultimate segment. The exopod nearly reaches the end of the antepenultimate joint.

The first pereiopod (fig. 22f) is slender, reaching slightly beyond the scaphocerite. The fingers are as long as the palm, unarmed. The carpus is longer than the chela and as long as the merus. The ischium is much shorter than the merus. The pereiopods (fig. 22g) are equal or slightly unequal, reaching with the chela or even with part of the carpus beyond the scaphocerite. The fingers measure $^2/_3$ of the length of the palm, both fingers bear two teeth on the proximal part of the cutting edge. The carpus is broadest anteriorly, narrowing towards the base, it is slightly shorter than the palm, the anterior margin bears no spines. The merus possesses no anteroventral spine, it is slightly longer than the carpus. The ischium is shorter than the merus. The last three pereiopods are slender. The third (fig. 22h) reaches slightly beyond the scaphocerite. The dactylus is slender, rather broad at base, and ending in a long slightly curved point. The propodus is three to four times as long as the dactylus and has the posterior margin provided with movable spinules. The carpus is about half as long as the propodus. The merus is about as long as the propodus. The ischium is about as long as the carpus. The fourth and fifth pereiopods are similarly built as the third.

The uropods are longer than the telson proper, but fail to reach the tips of the intermediate pair of spinules of the posterior margin of the telson. The outer margin of the exopod is straight or slightly convex, provided with setae and ending into two spines, the inner of which is movable. The upper surface of the endopod bears some scattered hairs.

My specimens differ from Borradaile's (1917a) description and figure in the following details:

1. The second joint of the antennular peduncle in my specimens is not longer than the third, generally even slightly shorter.
2. In my specimens the first two legs are stronger than figured by Borradaile, and the fingers are provided with teeth.

Distribution. This litoral species is recorded in literature only from S. Nilandu Atoll, Maldive Archipelago (Borradaile, 1915, 1917a).

Periclimenes (*Harpilius*) *amboinensis* (De Man)

Anchistia amboinensis De Man, 1888, Arch. Naturgesch., vol. 53 pt. 1, p. 546, pl. 22a fig. 2.

Periclimenes amboinensis Borradaile, 1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 383.
Periclimenes (*Corniger*) *amboinensis* Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 366.
Periclimenes (*Ancylocaris*) *amboinensis* Kemp, 1922, Rec. Indian Mus., vol. 24 p. 172.

The species is not represented in the material examined, but nevertheless is mentioned here, as it is recorded in literature from Indonesia.

Distribution. The only record of the present species is that by De Man (1888) from Amboina.

Periclimenes (*Harpilius*) *psamathe* (De Man) (fig. 23)

Urocaris psamathe De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 816, pl. 25 fig. 51.
Urocaris psamathe Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, pp. 323, 354, pl. 53 fig. 3.
Periclimenes (*Ancylocaris*) *psamathe* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 173.

Siboga Expedition

Station 164, between Misool and New Guinea, 1° 42′.5 S, 130° 47′.5 E; dredge; depth 32 m; bottom sand, small stones and shells; August 20, 1899. — 4 specimens 15-24 mm.

Snellius Expedition

Amboina; pier, 0-2 m; May 6, 1930. — 3 specimens (included ovigerous female) 17-25 mm.
Ternate; divinghood, 2-4 m; June 6, 1930. — 1 specimen 19 mm.

The length of the rostrum in my specimens varies between once and twice the length of the carapace. The teeth of the rostrum are arranged just like in De Man's figure. The hepatic spine

Fig. 23. *Periclimenes psamathe* (De Man). a, basal dorsal teeth of rostrum; b, mandible. a, b, × 75.

is placed at the same level as the antennal, sometimes even slightly higher than it. De Man states that the antennal peduncle is unarmed, in all my specimens, however, a small external tooth is present.

The teeth of the dorsal margin of the rostrum (fig. 23a) show a feature not noted by De Man or Borradaile: the upper part of the anterior margin of these teeth namely is finely serrate.

The oral parts are typical (fig. 23b).

Distribution. This litoral species is recorded in literature from: N. Male Atoll, Maldive Archipelago (Borradaile, 1917a), Diego Garcia, Chagos Archipelago (Borradaile, 1917a), Ternate (De Man, 1902).

Periclimenes (*Harpilius*) *galene* nov. spec. (fig. 24)

Snellius Expedition

Amboina; pier, 0-2 m; May 6, 1930. — 1 ovigerous female 16 mm.
Islet near Menado; September 25, 1930. — 2 specimens (juveniles) 11 and 12 mm.

The rostrum reaches slightly beyond the scaphocerite; the lower margin is straight, unarmed. The rostrum is highest above the eyes, sloping down towards the apex. One dorsal tooth is placed on the carapace behind the orbit and a considerable distance behind the second dorsal tooth. This second tooth is placed just above the orbit on the highest point of the rostrum; between this tooth and the apex of the rostrum six more dorsal teeth are present, the proximals placed close together, the distals being more spaced. The ultimate tooth is situated close to the apex. The carapace is smooth and provided with antennal and hepatic spines. The antennal spine is situated a large distance below the rounded lower orbital angle. The hepatic spine lies behind the antennal, on about the same level or even slightly above it. The anterolateral angle of the carapace is broadly rounded.

The abdomen is smooth. The pleurae of the first five segments are rounded. The posterior margin of the third segment is slightly produced in the median. The sixth abdominal segment is slightly more than twice as long as the fifth.

The telson is shorter than the sixth abdominal segment. The dorsal surface is provided with two pairs of small spinules, which are placed close to the lateral margins. The anterior pair of spinules is situated slightly before the middle of the telson, the posterior lies slightly closer to the anterior pair than to the posterior margin of the telson. This posterior margin is provided with three pairs of spinules; the outer pair is shortest, the intermediate pair longest and the inner pair is intermediate in length between the two other pairs.

The eyes are well developed. The cornea is as broad, but about half as long as the stalk; it is hemispherical and in my specimens of a bluish grey colour with two circular spots of dark pigment, one at the upper and one at the lower surface of the cornea. The eyes reach about $^3/_4$ of the basal segment of the antennular peduncle.

The basal segment of the antennular peduncle is long and not very broad, it reaches beyond the middle of the scaphocerite; the stylocerite is sharply pointed and directed slightly outward, it almost reaches the middle of the basal segment. The outer margin of the basal segment is convex and ends in a sharp tooth; the anterior margin is strongly convex. The second and third segments are subequal, together they are longer than half the basal segment. The two rami of the upper antennular flagellum are fused for 5 segments. The free part of the shorter ramus is about half as long as the fused part.

The scaphocerite has the inner margin almost parallel to the outer. The inner anterior angle of the lamella is more or less acute. The outer margin of the scaphocerite is slightly concave and ends in a strong tooth, which does not reach the end of the lamella. The scaphocerite reaches about to the end of the antennular peduncle. The basal part of the antennal peduncle is provided with a small external tooth. The last segment of the peduncle just fails to reach the end of the basal antennular segment.

The oral parts are quite typical.

The third maxilliped is small and narrow, reaching about to the base of the scaphocerite. The ultimate segment is as long as the penultimate. The antepenultimate segment is longest, the exopod fails to reach its apex.

The first pereiopod (fig. 24e) is slender, it fails to reach the end of the scaphocerite. The

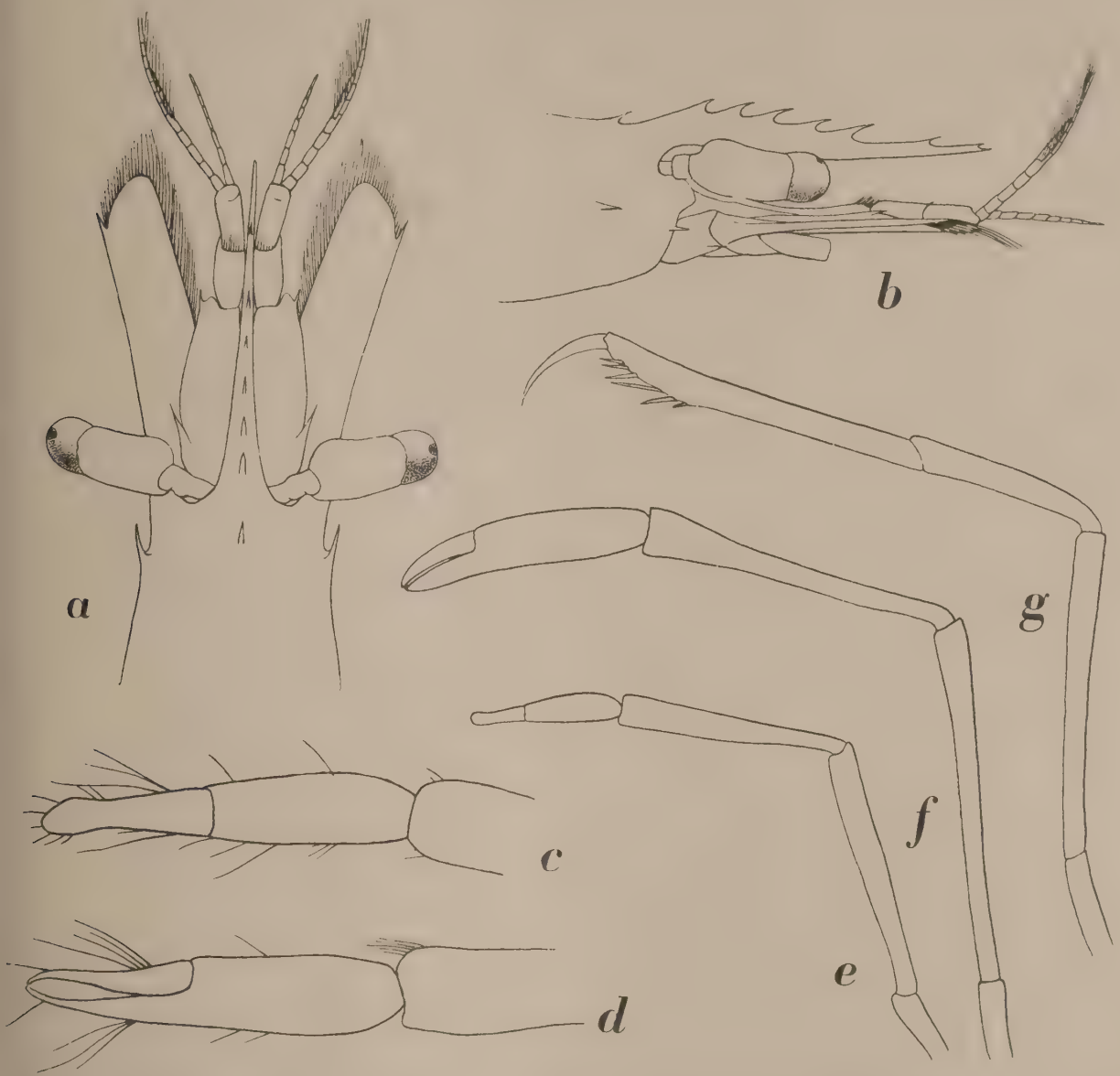


Fig. 24. *Periclimenes galene* nov. spec. a, anterior part of body, dorsal view; b, anterior part of body, lateral view; c, chela of first pereiopod, dorsal view; d, chela of first pereiopod, lateral view; e, first pereiopod; f, second pereiopod; g, fifth pereiopod. a, b, × 18; c, d, × 86; e-g, × 36.

fingers (figs. 24c, d) are shorter than the palm and have a peculiar shape: when seen from above they are rather narrow, depressed, and suddenly, like a spoon, broadened near the apex. The carpus is almost one and a half time as long as the chela. The merus is somewhat longer than the carpus. The second pereiopods (fig. 24f) are longer than the first, reaching almost with the entire chela

beyond the scaphocerite; they are not much stronger than the first pair. The fingers are half as long as the palm. The carpus is about one and a half time as long as the chela. The merus is unarmed and longer than the carpus. The ischium is about half as long as the merus. The last three pereiopods (fig. 24g) are slender. The third almost reaches the end of the scaphocerite. The dactylus is simple, long, strongly curved, being about one third of the length of the propodus. The propodus is distinctly broadened in the distal third and the posterior margin there is provided with about 8 very long and movable spines, the rest of the posterior margin is unarmed. This broadened and spinulate distal part and the strongly curved dactylus give the pereiopod a subprehensile appearance. The carpus is about $^2/_3$ of the length of the propodus. The merus is longer than the propodus. The ischium is short. The fourth and fifth legs are similarly built as the third.

The uropods are oval, and longer than the telson. The outer margin of the exopod is slightly convex, and naked, it ends into two spines, the inner of which is movable.

The young specimens from Menado differ from the adult female, of which the description is given above, by the much shorter rostrum, which reaches about to the end of the basal segment of the antennular peduncle and by bearing 5 or 6 teeth only on the dorsal margin of the rostrum proper. In one of the juveniles no tooth is placed on the carapace behind the orbit.

The present species shows a great affinity to *Periclimenes psamathe* De Man among specimens of which it was collected at Amboina, and firstly was considered by me to be an aberrant specimen of that species. It may, however, be distinguished at once by the shape of the rostrum and that of the pereiopods.

Periclimenes galene is closely related to *Periclimenes platalea* Holthuis from West Africa. The differences between these two species have already been pointed out in the original description of the Atlantic species (Holthuis, 1951, p. 160).

Periclimenes (*Harpilius*) ? *calmani* Tattersall

Periclimenes calmani Tattersall, 1921, Journ. Linn. Soc. Lond. Zool., vol. 34, p. 385, pl. 27 fig. 11, pl. 28 figs. 14, 15.
Periclimenes (*Ancylocaris*) *calmani* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 176.
? *Periclimenes* (*Ancylocaris*) *leptopus* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 173, figs. 31-33.
Periclimenes calmani Balss, 1927, Trans. zool. Soc. Lond., vol. 22, p. 223.
Periclimenes calmani Gurney, 1927, Trans. zool. Soc. Lond., vol. 22, pp. 229, 264, figs. 66-69.
Periclimenes Calmani Monod, 1930, Zool. Anz., vol. 92, p. 138.
Periclimenes Calmani Monod, 1932, La Terre et la Vie, vol. 2, p. 66.

Siboga Expedition

Station 65a, off Tanah Djampeah, Flores Sea, about 7° 0′ S, 120° 34′.5 E; dredge; depth 120-400 m; bottom pale grey mud, changing during haul into coral bottom; May 6, 1899. — 1 ovigerous female 12 mm.
Station 213, Salajar anchorage and surroundings, including Pasitanete Island; trawl, townet and reef exploration; depth up to 36 m; bottom coralreefs, mud and mud with sand; September 26-October 26, 1899. — 1 specimen 11 mm.

The present specimens show affinities to *Periclimenes calmani* Tattersall as well as to *Periclimenes leptopus* Kemp. From both species they differ in some points so much that I hesitate to

identify them with one of these species. On the other hand the differences are not so important in my opinion that the foundation of a new species is justified.

The rostrum is straight or slightly curved downward, reaching slightly beyond the antennular peduncle, but failing to reach the end of the scaphocerite. The upper margin bears seven teeth, the first of which is placed on the carapace behind the orbit, it is more remote from the second tooth than the third is. The second tooth is placed slightly beyond, almost over, the orbit. The lower margin bears two teeth. Both margins are provided with setae. The carapace is smooth, provided with antennular and hepatic spines, which are placed on almost the same level, just like in Kemp's figure of *Periclimenes leptopus* and in Tattersall's figure of *P. calmani.* The anterolateral angle is rounded.

The abdomen is smooth. The pleurae of the first five segments are rounded. The third abdominal segment is slightly produced in the median part of the posterior margin.

The telson bears two pairs of dorsal spinules, the first pair is placed before the middle of the telson, the second midway between the first pair and the posterior margin of the telson. The posterior spines of the telson are as in *P. leptopus.*

The eyes are broad; the cornea is hemispherical and as broad as, but shorter than the stalk. The ocellus is distinct and fused with the cornea.

The antennulae are shaped as in *P. leptopus.*

The scaphocerite reaches beyond the antennular peduncle. The outer margin is concave and ends in a strong tooth, which reaches beyond the lamella. The lamella is narrowed towards the top. In the specimen from Station 213 the lamella is somewhat broader than in the specimen from Sta. 65a.

The oral parts are typical for the genus.

The third maxilliped reaches slightly beyond the antennal peduncle. The last segment measures $^3/_4$ of the penultimate. The antepenultimate segment is longest and curved. The exopod reaches almost the end of the antepenultimate segment.

The first pereiopod reaches with the entire chela and part of the carpus beyond the scaphocerite. The fingers are longer than the palm and are unarmed. The carpus is about one and a half time as long as the chela. The merus is distinctly shorter than the carpus and slightly longer than the ischium. The second pereiopod reaches with the chela and the larger part of the carpus beyond the scaphocerite. The fingers are slender, distinctly shorter than the palm; the cutting edge in the specimen of Sta. 65a is unarmed, the specimen from Sta. 213 has the cutting edge in the larger leg as in *P. calmani,* in the smaller leg no teeth are visible. The length of the carpus is intermediate between that of the palm and the chela; the carpus is broadest anteriorly, narrowing posteriorly, unarmed. The merus is shorter than the carpus and longer than the ischium, it is unarmed. The last three pereiopods are slender. The dactylus is long, slender, curved and about $^1/_3$ of the length of the propodus. The propodus is provided with movable spines on the posterior margin, in the specimen from Sta. 213 these spines are not very distinct. The carpus is about half as long as the propodus. The merus is of the same length as the propodus, while the ischium is as long as the carpus.

The specimens differ from *P. calmani* in the following points:

1. Rostral formula: My specimens both have two ventral teeth, while Tattersall's specimen has four teeth on the lower margin.
2. The first pereiopods are longer, but the relation between their joints are as in *P. calmani.*

From *Periclimenes leptopus* they differ in the following points:

a. The merus of the first pereiopod is shorter than the carpus and not longer.
b. The fingers of the second pereiopods are shorter than the palm.
c. The carpus of the second pereiopod is shorter than the chela.
d. The propodi of the last three legs are provided with posterior spinules.

In the characters mentioned under 1 and 2 my specimens agree with *P. leptopus,* in those mentioned under a, b and c they agree with *P. calmani,* being thereby more or less intermediate between the two species. Kemp (1922) mentions the presence or absence of denticulations on the fingers as a character for distinguishing the two species, as shown by my material this character is not specific as in the specimen from Sta. 213 the larger leg is provided with such teeth on the fingers, the smaller leg being devoid of them. I think it therefore well possible that *P. leptopus* and *P. calmani* belong to one variable species; this, however, only can be proven by more material.

Vertical distribution. Gurney (1927) mentions that *Periclimenes calmani* in the Suez Canal occurs in water of about 2 meters deep, but never is found in quite shallow water along the shore. Kemp's specimens of *P. leptopus* are collected between 3.5 and 9 m depth.

Horizontal distribution. *Periclimenes calmani* is known from: Port Said (Balss, 1927), Lake Timsah, Suez Canal (Balss, 1927), near Kabret, Suez Canal (Balss, 1927), Sudan coast, Red Sea (Tattersall, 1921). *P. leptopus* is known from Brigade Creek, Port Blair, Andaman Islands (Kemp, 1922).

Periclimenes (*Harpilius*) *seychellensis* Borradaile (fig. 25)

Periclimenes ensifrons Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 234.
Periclimenes tenuipes p.p. Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 235.
Periclimenes (*Falciger*) *seychellensis* Borradaile, 1915, Ann. Mag. nat. Hist., ser. 8 vol. 15, p. 212.
Periclimenes (*Falciger*) *seychellensis* Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, pp. 324, 375, pls. 54, 55 fig. 14 a-i.
Periclimenes (*Ancylocaris*) *seychellensis* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 176, textfigs. 34, 35, pl. 6 fig. 7.

Siboga Expedition

Near Station 76, southern entrance of Makassar Strait, about 4° 22′.1 S, 118° 16′.9 E; in floating *Sargassum*; June 9, 1899. — 3 specimens (1 of which is an ovigerous female) 10-12 mm.
Station 230, Banda Sea south of Amboina, 3° 58′ S, 128° 20′ E; in floating *Sargassum*; November 14, 1899. — 1 ovigerous female 13 mm.

Snellius Expedition

Station 64, Sulu Sea, 7° 41′.0 N, 121° 01′.5 E; surface, handnet; September 6, 1929. — 2 ovigerous females 14 and 15 mm.
Sipankot, near Sibutu, Sulu Islands; between seagrass near the shore; September 11, 1929. — 4 specimens (one of which is an ovigerous female) 12-16 mm.
Kera near Timor; depth 0-1 m; November 11-13, 1929. — 2 specimens 10 and 12 mm.
Station 363, Banda Sea, 6° 02′.0 S, 131° 52′.0 E; October 23, 1930. — 5 specimens 6-17 mm.

The specimens agree well with Kemp's description. The tubercle on the eyestalk is distinct in all specimens. The carpus of the second pereiopods often is slightly longer than the palm.

The oral parts are typical; the molar process of the mandible (fig. 25) bears no spines.

Two specimens of this species are preserved in the collection of the Museo Civico di Storia Naturale in Genoa, Italy, both originating from Beagle Bay, Papua. The smaller of the two specimens (11 mm long) has been reported upon by Nobili (1899) under the name *Periclimenes ensifrons*. The other, an ovigerous female of 12 mm, formed part of the material identified by Nobili (1899) as *Periclimenes tenuipes*; the other specimens brought by Nobili to the latter species proved to belong to *Leander tenuicornis* (Say).

Fig. 25. *Periclimenes seychellensis* Borr. mandible. × 75.

Vertical distribution. Kemp (1922) states that he collected the species among weeds in shallow water. Most specimens from the Siboga and from the Snellius Expedition are found among floating weeds on high sea.

Horizontal distribution. The species is recorded from: Ain Musa and Tor, both in the Gulf of Suez (Kemp, 1922), Praslin, Seychelles (Borradaile, 1915, 1917a), Kilakarai and Pamban, both in the Gulf of Manaar (Kemp, 1922), Port Blair, Andaman Islands (Kemp, 1922), Beagle Bay, Papua (Nobili, 1899). The present records from the Malay Archipelago extend the known range of distribution of the species.

Periclimenes (*Harpilius*) *jugalis* nov. spec. (fig. 26)

Siboga Expedition

Station 273, anchorage off Djedan Island, eastcoast of the Aru Islands; pearl banks; trawl, dredge and divers; depth 13 m; bottom sand and shells; December 23-26, 1899. — 1 specimen 16 mm.

The rostrum is straight, it almost reaches the end of the antennular peduncle. It is not very high; the upper margin is provided with 9 teeth, which are placed at about equal distances from each other; only the first, which is placed on the carapace, is situated closer to the second than the third is. The second tooth is placed just over the posterior margin of the orbit. The lower margin of the rostrum is straight and provided with two small teeth in the anterior part; the posterior of these teeth, which is largest, is placed slightly before the penultimate dorsal tooth; the anterior ventral tooth, which is extremely small, lies on a level between the apex and the ultimate dorsal tooth. The posterior part of the ventral margin of the rostrum is provided with a row of setae. The carapace is smooth and provided with antennal and hepatic spines. The antennal spine is placed below the lower orbital angle, which is strongly forwards produced so as to form a narrow lobe. The hepatic spine is situated

behind the antennal and lies on a much lower level. The anterolateral angle of the carapace is rectangular, and rounded at the top.

The abdomen is smooth. The pleurae of the first three segments are broadly rounded, those of the fourth and fifth segments are narrower, but with rounded tips. The third abdominal segment is slightly produced in the median posterior part. The sixth abdominal segment is almost twice as long as the fifth.

The telson is slightly longer than the sixth abdominal segment, its dorsal surface is provided with two pairs of very small spinules in the posterior half. The posterior pair lies midway between the anterior pair and the posterior margin of the telson. This posterior margin is provided with three pairs of spinules, the intermediate of which are longest.

The eyes are well developed. The hemispherical cornea is as broad as and distinctly shorter than the stalk. The ocellus is fused with the cornea, and is rather distinct.

The first segment of the antennular peduncle is broad; the stylocerite is small, sharply pointed and reaches about to the middle of the basal segment. The anterolateral spine of the basal segment is strong and reaches the middle of the second segment; the anterior margin of the basal segment is strongly convex. The second segment is distinctly shorter and broader than the third, together they measure about $^2/_3$ of the first segment. The upper antennular flagellum has the fused part of the two rami consisting of about 5 segments, the free portion of the shorter ramus is broken at both sides in my specimen.

The scaphocerite reaches distinctly beyond the antennular peduncle. The lamella is rather broad, reaching beyond the final tooth. The anterolateral angle of the lamella is rather acute. The outer margin of the scaphocerite is straight or somewhat concave. The antennal peduncle bears a stout spine.

The oral parts are typical.

The third maxilliped does not reach the end of the antennal peduncle. The last segment is about $^2/_3$ of the length of the penultimate. The antepenultimate segment is longest, slender, with the exopod failing to reach its distal end.

The first pereiopod (fig. 26c) is rather stout and reaches with the fingers only beyond the scaphocerite. The fingers are shorter than the palm and unarmed, their tips are provided with tufts of hair. The carpus is slightly longer than the chela and about as long as the merus. The second pereiopod (fig. 26d) is strong, reaching with the carpus and the chela beyond the scaphocerite. The fingers are short, being less than half as long as the palm, the tips are crossing. The cutting edge of the dactylus bears one, that of the fixed finger two proximal teeth, the upper tooth fits between the two lower; the rest of the edges is unarmed. The carpus is about half as long as the chela and is slightly broadened anteriorly. The anterior margin bears no teeth. The merus is intermediate in length between the carpus and the palm, it is as long as the ischium; no anteroventral tooth is present on the merus. As only one of the second pereiopods is present in my specimen it is not known whether the right and left legs are equal. The last three pereiopods are slender. The third (fig. 26e) just fails to reach the end of the scaphocerite. The dactylus is about $^1/_5$ to $^1/_6$ of the length of the propodus, it is simple with a slender, curved tip. The propodus is provided with some posterior denticles and some long hairs. The carpus is more than half as long as the propodus. The merus is broader than the other joints and is as long as the propodus or slightly longer than it. The ischium is about half as long as the merus.

The uropods reach beyond the end of the telson, the endopod, however, fails to reach the end of the posterior spinules of the telson. The exopod has the outer margin straight, provided with a row of setae along the lower border and ends into two spines the outer of which is rather inconspicuous.

The present species is most closely related to *Periclimenes diversipes* Kemp, but differs from that species in the shape of the rostrum, in the strongly produced lower orbital angle and in the shape

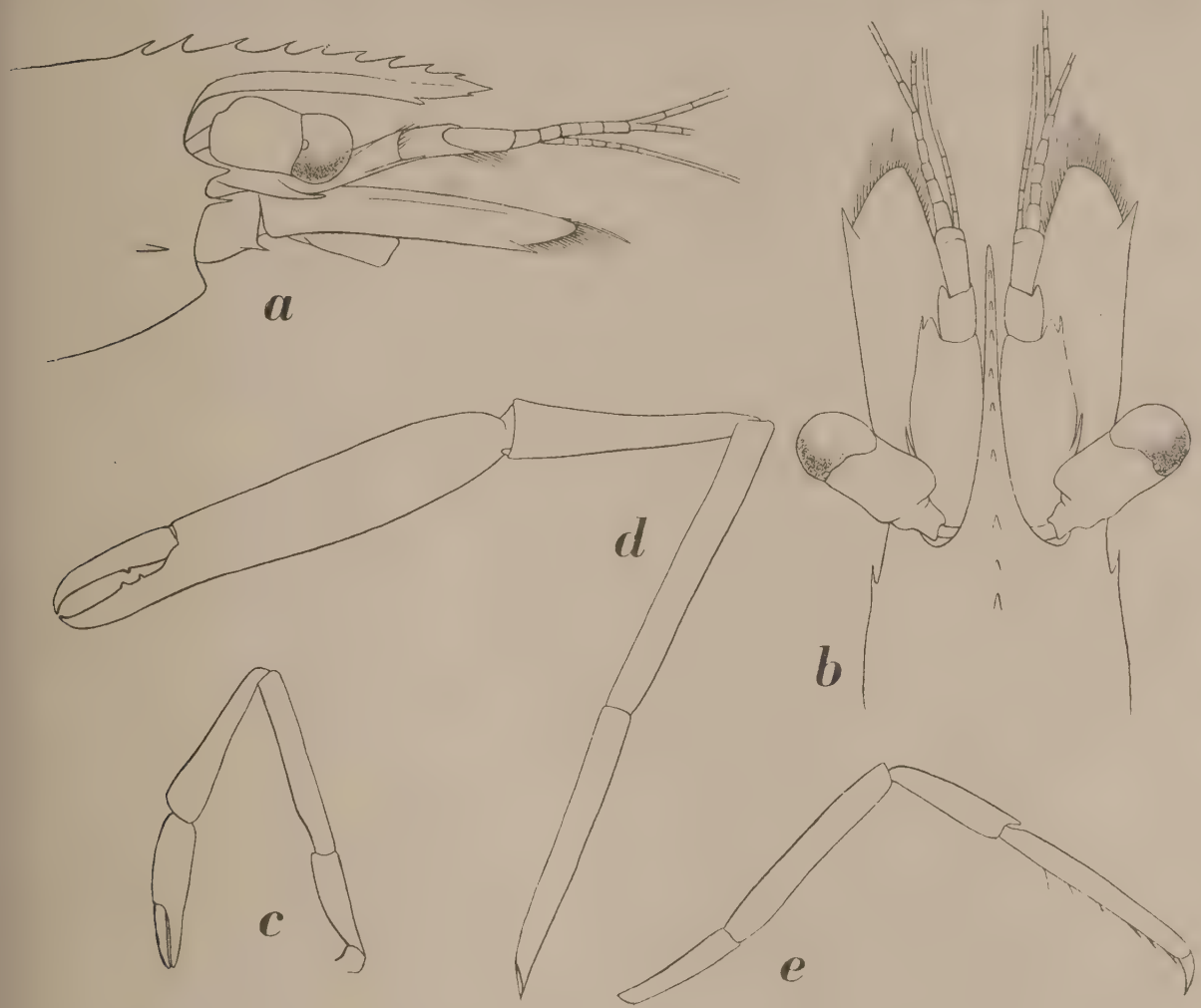


Fig. 26. *Periclimenes jugalis* nov. spec. a, anterior part of body, lateral view; b, anterior part of body, dorsal view; c, first pereiopod; d, second pereiopod; e, third pereiopod. a-e, × 18.

of the second pereiopods, which is entirely different from each of the four types, which may be found in *P. diversipes.*

Periclimenes (*Harpilius*) *brevicarpalis* (Schenkel) (fig. 27)

Nicht bestimmte Palaemonide Richters, 1880, Beitr. Meeresfauna Mauritius, pl. 18 figs. 10, 11.
Palaemon sp. Saville-Kent, 1893, Barrier Reef of Australia, p. 145, chromopl. 2.
Palaemonella amboinensis Zehntner, 1894, Rev. Suisse Zool., vol. 2, p. 206, pl. 9 fig. 27.
Bithynis spec. Coutière, 1898, Bull. Mus. Hist. nat. Paris, vol. 4, p. 198.
Palaemonella amboinensis De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 811.

Ancylocaris brevicarpalis Schenkel, 1902, Verh. naturf. Ges. Basel, vol. 13, p. 563, pl. 13 fig. 21.
Palaemonella aberrans Nobili, 1904, Bull. Mus. Hist. nat. Paris, vol. 10, p. 234.
Harpilius latirostris Lenz, 1905, Abh. Senckenb. naturf. Ges., vol. 27, p. 380, pl. 47 fig. 14.
Periclimenes potina Nobili, 1905, Bull. Mus. Hist. nat. Paris, vol. 11, p. 159.
Periclimenes potina Nobili, 1906, Bull. sci. France Belg., vol. 40, p. 44, pl. 3 fig. 8.
Ancylocaris aberrans Nobili, 1906, Bull. sci. France Belg., vol. 40, p. 52, pl. 4 fig. 9.
Ancylocaris aberrans Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 64.
Palaemonella amboinensis Bedot, 1909, Rev. Suisse Zool., vol. 17, p. 166.
Periclimenes hermitensis Rathbun, 1914, Proc. zool. Soc. Lond., 1914, p. 655, pl. 1 figs. 1-3.
Ancylocaris aberrans Kemp, 1916, Rec. Indian Mus., vol. 12, p. 389.
Ancyclocaris brevicarpalis Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 355.
Ancyclocaris aberrans Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 356.
Ancyclocaris latirostris Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 356.
Ancyclocaris hermitensis Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 356.
Palaemonella amboinensis Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 358.
Periclimenes potina Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 363.
Periclimenes (*Ancylocaris*) *potina* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 184.
Periclimenes (*Ancylocaris*) *brevicarpalis* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 185, textfigs. 40-42, pl. 6 fig. 8.
Periclimenes (*Ancylocaris*) *brevicarpalis* McCulloch & McNeill, 1923, Rec. Aust. Mus., vol. 14, p. 58, fig. 2.
Periclimenes brevicarpalis Gravely, 1927, Bull. Madras Govt. Mus., n. ser. vol. 1, p. 137, pl. 19 fig. 3.
Periclimenes brevicarpalis Stephenson, Stephenson, Tandy & Spender, 1931, Sci. Rep. Great Barrier Reef Exped., vol. 3, pp. 47, 73.
Periclimenes brevicarpalis Roughley, 1936, Wonders Great Barrier Reef, p. 271.
Periclimens (*Ancylocaris*) *brevicarpalis* Yu, 1936a, Chin. Journ. Zool., vol. 2, p. 91.
Periclimenes (*Ancylocaris*) *brevicarpalis* Kubo, 1940, Journ. Imp. Fish. Inst., vol. 34, p. 46, figs. 13, 14.
Periclimenes (*Ancylocaris*) *brevicarpalis* Barnard, 1947, Ann. Mag. nat. Hist., ser. 11 vol. 13, p. 391.
Periclimenes (*Ancylocaris*) *brevicarpalis* Nayar, 1947, Proc. Indian Acad. Sci., sect. B vol. 26, p. 168, figs. 1-10.
Periclimenes (*Ancylocaris*) *brevicarpalis* Barnard, 1950, Ann. S. Afr. Mus., vol. 38, p. 794, fig. 150e-h.

Siboga Expedition

Station 50, Bay of Badjo, westcoast of Flores; dredge, trawl and shore exploration; depth up to 40 m; bottom mud, sand and shells, according to locality; April 16-18, 1899. — 2 ovigerous females 15 and 16 mm.

Station 76, southern entrance of Makassar Strait, 4° 22'.1 S, 118° 16'.9 E; in *Sargassum*; June 9, 1899. — 1 specimen 11 mm.

Station 93, Sanguisiapo Island, Tawitawi Group, Sulu Archipelago; reef; depth 12 m; June 24 and 25, 1899. — 1 ovigerous female 20 mm.

Station 149, anchorage off Fau Island, westcoast of Gebe Island; reef; depth 31 m; August 10 and 11, 1899. — 1 specimen 26 mm.

Station 313, anchorage east of Dangar besar, Saleh Bay, Sumbawa; reef; depth up to 36 m; in Actinian; February 14-16, 1900. — 2 specimens 20 and 21 mm.

Snellius Expedition

Red Sea, 17° 30' N, 40° 30' E; surface, handnet; April 17, 1929. — 2 specimens 9 and 10 mm.

Maratua; reef; August 14-18, 1929. — 2 specimens (one of which is an ovigerous female) 29 and 35 mm.

Station 64, Sulu Sea, 7° 41'.0 N, 121° 01'.5 E; surface, handnet; September 6, 1929. — 2 specimens 8 and 12 mm.
Station 330, Ceram Sea, 2° 22'.5 S, 128° 00'.5 E; September 8, 1930. — 5 specimens 11-17 mm.
Station 363, Banda Sea, 6° 02'.0 S, 131° 52'.0 E; October 22, 1930. — 1 specimen 10 mm.

Museum Leiden

Bay of Djakarta (= Batavia); 1927; leg. W. C. van Heurn. — 1 ovigerous female 20 mm.
Amboina; 1877; leg. J. E. Teysmann. — 1 specimen 34 mm.
Amboina; 1879; leg. Schorel. — 1 specimen 36 mm.
Waigeo, northwest of New Guinea; 1864; leg. H. A. Bernstein. — 1 specimen 30 mm.

Museum Amsterdam

Inhaca, Portuguese E. Africa; leg. C. J. van der Horst. — 1 specimen 32 mm.
Serute Island, north of E. Flores, 123° 1' 29" E, 8° 9' 7" S; from coralreefs, exposed during springtide (lowtide); November 11, 1908; leg. G. A. J. van de Sande. — 1 specimen 22 mm.

The oral parts of *P. brevicarpalis* are quite typical, the maxillula is figured here (fig. 27a). The mandible bears spines on the molar process.

The endopod of the first pleopod of the male has the inner margin not distinctly concave (fig. 27b).

Kemp (1922) extensively dealt with the present species and pointed to its variability. He also showed the identity of *Ancylocaris aberrans, hermitensis* and *latirostris* with the present species.

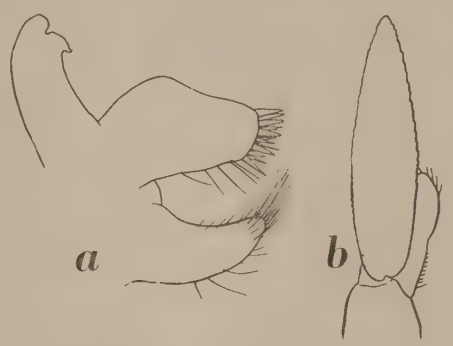


Fig. 27. *Periclimenes brevicarpalis* (Schenkel). a, maxillula; b, first pleopod of male. a, × 50; b, × 21.

He referred *Palaemonella amboinensis* Zehntner with some doubt to this species. In my opinion there is no reason for this doubt as the small number of points in which Zehntner's figure of *Palaemonella amboinensis* differs from *Periclimenes brevicarpalis* are probably due to inaccuracy of the drawing, as also is stated by De Man (1902); almost the same inaccuracy is shown in Lenz's figure of *Harpilius latirostris*, here namely the antennular peduncle and the scaphocerite also are not entirely correctly drawn.

As Zehntner's (1894) description of *Palaemonella amboinensis* is published before Schenkel's (1902) *Ancylocaris brevicarpalis*, the specific name *amboinensis* should have priority over *brevicarpalis* and the new combination *Periclimenes amboinensis* (Zehntner) should have to be used; this latter name, however, is preoccupied by the name *Periclimenes amboinensis* (De Man, 1888) Borradaile, 1898, so that *Periclimenes brevicarpalis* remains the correct name for the present species.

Nobili (1905, 1906) described a new species, *Periclimenes potina* from floating weeds off the South Arabian coast. Kemp (1922) in his key separates this species from *Periclimenes brevicarpalis* on the supposed longer carpus of the second pereiopod: this carpus in *P. potina* should be longer, in *P. brevicarpalis* shorter than half the length of the palm. Now Nobili (1906) in his description of *P. potina* states: "Le carpe [of the second pereiopod] est très court, à peine plus long que le quart de la main entière." Because the palm, as stated by Nobili, in *P. potina* is slightly longer than the fingers, the carpus must be about half as long as the palm. Now in *P. brevicarpalis* the carpus not always is distinctly shorter than half the palm, sometimes (especially in younger specimens) it is as long as half the palm or even slightly longer, which also is shown in Kemp's pl. 6 fig. 8. Nevertheless the shortness of the carpus remains a very good character to distinguish *P. brevicarpalis* from species as *P. calmani* and *P. seychellensis*. When comparing Nobili's description of *P. potina* with that of Kemp of *P. brevicarpalis* I only could find following differences:

1. the first pereiopod in *P. potina* is shorter; it does not reach the end of scaphocerite.
2. the second pereiopod in *P. potina* is shorter too.
3. the fingers of the first pereiopod in *P. potina* are gaping.

The first two characters are of a juvenile nature as also is shown in my material of young specimens of the present species. The last character may be explained by the fact that the margin of each finger near the cutting edge is very thin and transparent in young specimens, so that when seen from aside the fingers indeed seem to be gaping, but when seen in oblique view it becomes clear that they in reality are closed over their entire length. It is therefore obvious that *Periclimenes potina* Nobili is nothing else but a juvenile stage of *Periclimenes brevicarpalis*.

According to a note of the collector, the specimen from Serute Island (Museum Amsterdam) was collected after being drugged by "tuba" (*Derris elliptica* Benth.) a well known fishpoison.

Vertical distribution. The species is a litoral form and the adult specimens live in association with sea-anemones of the genera *Thalassianthus* and *Stoichactis*; in literature the latter genus often is mentioned under the name *Discosoma* Ehr. The records are: *Stoichactis* spec. (Kemp, 1916, 1922; Borradaile, 1917; McCulloch & McNeill, 1923; Barnard, 1950), *Stoichactis giganteum* (Forssk.) (Coutière, 1898; Nobili, 1906a, b; Gravely, 1927; Nayar, 1947), *Stoichactis haddoni* (Saville-Kent) (Saville-Kent, 1893), *Stoichactis kenti* (Hadd. & Sh.) (Stephenson, Stephenson, Tandy & Spender, 1931; Kubo, 1940), *Thalassianthus hypnoides* (Saville-Kent) (Stephenson, Stephenson, Tandy & Spender, 1931). Young specimens are found among floating weeds on high sea.

Horizontal distribution: Records in literature are: Jibuti (Coutière, 1898; Nobili, 1904, 1906b), Bawi and Kokotoni, Zanzibar (Lenz, 1905), Delagoa Bay, S.E. Africa (Barnard, 1947, 1950), Mauritius (Richters, 1880), off the southcoast of Arabia, 16° 35′ N, 54° 26′ E (Nobili, 1905, 1906), Bahrein Island, Persian Gulf (Nobili, 1906), Gulf of Manaar (Nayar, 1947), Krusadai Island, Gulf of Manaar (Gravely, 1927), Kilakarai, Gulf of Manaar (Kemp, 1922), Spike Island, Great Coco Island and Port Blair, Andaman Islands (Kemp, 1922), Hai-kiu-sche, Hainan, S. China (Yu, 1936a), Isigaki Island, Okinawa Group, Riukiu Islands (Kubo, 1940), Makassar, Celebes (Schenkel, 1902), Ternate (De Man, 1902), Amboina (Zehntner, 1894), Hermite, Monte Bello Islands, W. Australia (Rathbun, 1914), Torres Straits (Borradaile,

1917), Murray Island, Torres Straits (McCulloch & McNeill, 1923), Great Barrier Reef (Saville-Kent, 1893; McCulloch & McNeill, 1923; Stephenson, Stephenson, Tandy & Spender, 1931; Roughley, 1936), Hope Island, off Cooktown, N. Queensland (McCulloch & McNeill, 1923), Port Denison, Queensland (McCulloch & McNeill, 1923), Saddleback Island, off Port Denison (McCulloch & McNeill, 1923), Santa Cruz Islands, Oceania (Kemp, 1922).

Periclimenes (Harpilius) batei Holthuis

Brachycarpus audouini Bate, 1888, Rep. Voy. Challenger, Zool., vol. 24, p. 798, pl. 129 fig. 5.
Palaemon audouini Ortmann, 1891, Zool. Jb. Syst., vol. 5, p. 728 (non Heller, 1862).
Brachycarpus Audouini Thomson, 1903, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 8, p. 451.
Brachycarpus audouini Hutton, 1904, Index Faun. Nov. Zeal., p. 255.
Brachycarpus audouini Thomson, 1913, Trans. Proc. New Zeal. Inst., vol. 45, p. 240.
Periclimenes (Ancylocaris) audouini Kemp, 1925, Rec. Indian Mus., vol. 27, p. 326.
Periclimenes batei Holthuis, 1950a, Siboga Exped., mon. 39 a 9, p. 22.

The present species, of which no material is at my disposal, for the first time was described by Bate (1888) under the name *Brachycarpus audouini*. Ortmann (1891) transferred the species to the genus *Palaemon*. As the name *Palaemon audouini* is used already as early as 1862 by Heller for a species of *Macrobrachium*, Bate's name may not be used as it is a younger homonym. Kemp (1925) showed that the species of Bate in reality belongs to the genus *Periclimenes*. As no other specific name than *audouini* had been used for the species, and as this name is invalid I proposed the new name *Periclimenes batei* for it in my 1950a paper.

Vertical distribution. The species is reported by Bate (1888) and by Thomson (1903) from a depth of 18 m, Thomson (1903) remarks that "it is apparently common in shallow waters round the coasts."

Horizontal distribution. The species is only known from New Zealand. The records in literature are: Cook Strait, 41° 4′ S, 174° 19′ E (Bate, 1888), Tasman Bay and Blueskin Bay, Middle Island (Thomson, 1903), Otago Harbour, Middle Island (Thomson, 1913).

Periclimenes (Harpilius) sibogae nov. spec. (figs. 28, 29)

Siboga Expedition

Station 240, Banda anchorage; trawl, dredge and reef exploration; depth 9-36 m; bottom black sand and coral, lithothamnion bank in 18-36 m; November 22 to December 1, 1899. — 1 specimen 16 mm.

The rostrum is long and slender, reaching beyond the antennular peduncle, but failing to reach the end of the scaphocerite. The upper margin is provided with seven teeth, the first of which is situated on the carapace behind the posterior margin of the orbit; the distal teeth are placed closer together than the proximals. The lower margin of the rostrum bears two teeth, which are placed a considerable distance before the apex. The carapace is smooth and provided with antennal and hepatic spines only. The antennal spine is placed some distance below the rounded lower orbital angle. The

hepatic spine is smaller than the antennal and placed behind it on a lower level. The anterolateral angle of the carapace is rounded.

The abdomen is smooth. The pleurae of the first four segments are broadly rounded, that of the fifth segment ends in a posteriorly directed tooth. The sixth segment is short, being only slightly longer than the fifth. The telson in my specimen is broken close to the base. In the remaining part no spinules are visible.

The eyes are well developed. The cornea is hemispherical and a small but distinct ocellus is present; the pigment of the cornea seems to be arranged so that it leaves two rather large spots, one in the upper and one in the lower part of the cornea without pigment. The eyestalk is narrower than the cornea.

The basal segment of the antennular peduncle is broad; the stylocerite is small and sharply pointed, it reaches almost the middle of the segment. The anterolateral spine of the basal segment is strong and reaches beyond the middle of the second segment of the peduncle. The second and third peduncular segments are small and narrow, subequal in length and together less than half as long as the first segment of the peduncle. The upper flagella are very unequal: the left has the two rami fused for about 15 segments, the right for about 6 segments. In both the free part of the shorter ramus is rather short and consists of about three joints.

The scaphocerite is slender, narrowing towards the top, being there about half as broad as at the base. The final tooth reaches distinctly beyond the lamella. The outer margin of the scaphocerite is concave. The basal part of the antennal peduncle is provided with a strong outwards directed spine. The end of the peduncle reaches about $^1/_3$ of the scaphocerite.

The oral parts are typical.

The third maxillipeds reach about to the base of the scaphocerite, they fail to reach the end of the antennal peduncle. The ultimate segment is short, measuring about $^2/_3$ of the penultimate segment, which is about half as long as the antepenultimate; the latter is slender and curved. The exopod reaches distinctly beyond the end of the antepenultimate segment.

The first pereiopods (fig. 28c) are slender and reach with part of the carpus beyond the scaphocerite. The chela is broad, the fingers are distinctly longer than the palm, both are provided at the cutting edges with a series of pectinations. The palm is about quadrangular. The carpus is more than twice as long as the chela, it is narrow at its base, broadening rapidly in the anterior third. The merus is slightly shorter than the carpus. The second legs (fig. 28d, e) are robust, the left leg is stronger than the right. The dactylus of the left leg is compressed, highest anteriorly and provided at the lower margin with two small blunt teeth; the fixed finger is slender, the cutting edge provided with about seven blunt teeth. The tips of the fingers are strongly curved and crossing. The palm is about twice as long as the fingers, it is somewhat swollen, cylindrical. The carpus is less than half as long as the palm, narrow at its base, gradually broadening anteriorly. The anterior margin of the carpus bears three very strong spines, one in the dorsal, one in the ventral and one in the inner part of the margin. The merus is slender and measures one and a half times the length of the carpus, it does not possess any anteroventral spine. The right pereiopod differs from the left by the more slender shape of all joints; furthermore the dactylus is as slender as the fixed finger; the fingers are only slightly shorter than the palm. The last three pereiopods are slender. The dactylus of the third leg (fig. 28f) is simple and about one fourth to one fifth of the length of the propodus. The propodus

is provided with spinules at the posterior margin. The carpus is slightly less than half as long as the propodus, the anterior margin forms a lobe over the articulation with the propodus as in many species

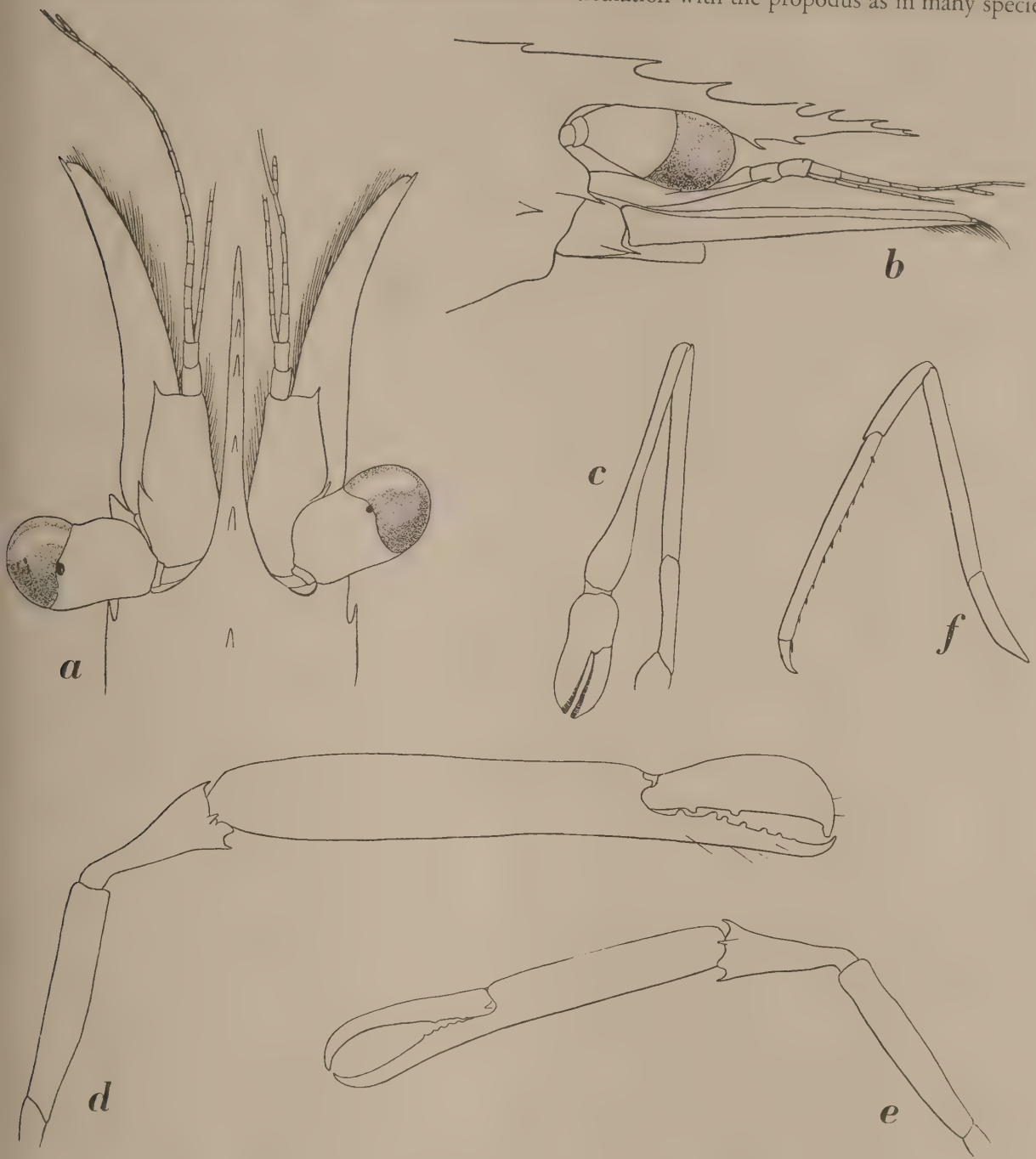


Fig. 28. *Periclimenes sibogae* nov. spec. a, anterior part of body, dorsal view; b, anterior part of body, lateral view; c, first pereiopod; d, left second pereiopod; e, right second pereiopod; f, third pereiopod. a-c, f, × 15; d, e, × 10.

of the present genus. The merus is twice as long as the carpus. The fourth and fifth legs are similarly built as the third.

The first two pleopods of the male are shown in figs. 29a, b.

The uropods are ovate; the exopod has the outer margin straight and ending into two spines, it is provided with a row of setae along its lower border.

The present species shows most affinity to *Periclimenes frater,* which is the only other species of the subgenus *Harpilius,* which has the fingers of the first pereiopod pectinate and the merus of

Fig. 29. *Periclimenes sibogae* nov. spec. ♂. a, first pleopod; b, second pleopod. a, b, × 56.

the second pereiopod without an anteroventral tooth. Furthermore it agrees with that species in the absence of a supraorbital spine, in the presence of a hepatic spine, in the short carpus of the second legs. It differs from *P. frater* by having only one spine at the anterolateral angle of the basal segment of the antennular peduncle and by the different rostral formula. As already pointed out (pp. 52, 53) *P. frater* probably is a synonym of *P. soror,* in which case it has to be referred to the subgenus *Periclimenes* s.s.

Periclimenes (*Harpilius*) *spiniferus* De Man (fig. 30)

Anchistia inaequimana Heller, 1865, Reise Novara Zool., ser. 2 vol. 3, p. 109.
Periclimenes Petitthouarsii De Man, 1888, Arch. Naturgesch., vol. 53 pt. 1, p. 541.
Palaemonella tridentata Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 235.
Periclimenes petitthouarsii var. *spinifera* De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 824.
Periclimenes Petitthouarsii var. *spinigera* Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 49.
Periclimenes Petitthouarsi var. *spinifera* Lenz, 1910, Voeltzkow's Reise Ost-Afrika, vol. 2, p. 567.
Periclimenes petitthouarsi var. *spinifera* Pesta, 1914, Denkschr. Akad. Wiss. Wien, vol. 89, p. 675.
Periclimenes (*Falciger*) *spiniferus* Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, pp. 324, 369, pl. 52 fig. 1.
Periclimenes (*Ancylocaris*) *spiniferus* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 195.
Periclimenes spiniferus Balss, 1925, Wiss. Ergebn. Valdivia Exped., vol. 20, p. 293.
Periclimenes (*Falciger*) *spiniferus* Edmondson, 1925, Bull. Bishop Mus. Honolulu, n. 27, p. 8.
Periclimenes (*Ancylocaris*) *spiniferus* Kemp, 1925, Rec. Indian Mus., vol. 27, p. 322.
Periclimenes (*Ancylocaris*) *spiniferus* McNeill, 1926, Aust. Zool., vol. 4, p. 300.
Periclimenes spiniferus Gravely, 1927, Bull. Madras Govt. Mus., n. ser. vol. 1, p. 137, pl. 19 fig. 4.
Periclimenes spiniferus Stephenson, Stephenson, Tandy & Spender, 1931, Sci. Rep. Great Barrier Reef Exped., vol. 3, p. 47.
Periclimenes (*Ancylocaris*) *spiniferus* Boone, 1935, Bull. Vanderbilt mar. Mus., vol. 6, p. 165, pl. 44.
Periclimenes (*Ancylocaris*) *spiniferus* Armstrong, 1941, Amer. Mus. Novit., n. 1137, p. 12.

Siboga Expedition

Station 78, Lumulumu shoal, Borneo Bank; reef; depth 34 m; bottom coral and coralsand; June 10 and 11, 1899. — 4 specimens 13-22 mm.
Station 79b, Kabala dua Island, Borneo Bank; reef; depth 22 m; bottom coralsand; June 12 and 13, 1899. — 1 ovigerous female 16 mm.
Station 115, eastside of Pajunga Island, Kuandang Bay; reef; July 9-11, 1899. — 1 specimen 14 mm.
Station 172, anchorage between Geser and Ceramlaut, reef; depth 18 m; coral- and lithothamnion-bottom; August 26-28, 1899. — 1 specimen 11 mm.

Snellius Expedition

Maratua; reef; August 14-18, 1929. — 3 specimens 13-15 mm.
Kera near Timor; November 11-13, 1929. — 2 specimens 15 and 16 mm.
Sarappo, Spermonde Archipelago, near Makassar; shore; March 1, 1930. — 1 specimen 12 mm.
Bone Tambung, Spermonde Archipelago, near Makassar; shore and reef; March 2, 1930. — 1 specimen 17 mm.
Obi latu; shore and reef; April 27, 1930. — 3 specimens 13-17 mm.
Ake Selaka, Kau Bay, Halmaheira; May 28, 1930. — 1 specimen 18 mm.
Karaton, Nenusa Islands; shore; May 20, 1930. — 4 specimens (included ovigerous females) 8-20 mm.
Beo, Karakelong, Talaud Islands; 6-10 m; June 14-21, 1930. — 1 specimen 11 mm.

Museum Amsterdam

Berhala Island, eastcoast of Sumatra; December 26, 1929; leg. J. C. van der Meer Mohr. — 7 specimens (included ovigerous females) 8-23 mm.

The cornea in all my specimens is provided with a ring of black pigment, as is also observed by Kemp (1922) in his material; the ring is interrupted at the place where it touches the line that separates the cornea from the eyestalk; inside the ring no pigment could be observed, outside pigment is present, but there the cornea still is much paler than the ring.

The oral parts of the species are quite typical, they have already been figured by Borradaile (1917a).

The first two pleopods of the male are figured here (figs. 30a, b), the endopod shows the shape typical of the members of *Harpilius*.

Boone's (1935) statement that the typeseries of the present species should be preserved in the Leiden Museum is quite erroneous; firstly there is no typeseries but only a typespecimen, namely the specimen described by De Man in 1902; furthermore the typespecimen in all probability is preserved in the Senckenberg Museum and the specimens described by De Man (1888) as *Periclimenes petitthouarsii* according to Lenz (1910) are deposited in the Lübeck Museum.

The specimen from Beagle Bay identified by Nobili, 1899, as *Palaemonella tridentata* still is present in the collection of the Museo Civico di Storia Naturale in Genoa, Italy, where it was examined by me in June 1950. It proved to belong to *Periclimenes spiniferus*.

Distribution. This litoral species is recorded in literature from: Tamatave Reef, E. Madagascar (Lenz, 1910), Coetivy, Seychelles (Borradaile, 1917a), Mahé, Seychelles (Balss, 1925), Goidu, Goifurfehendu Atoll, Maldive Archipelago (Borradaile, 1917a), Hulule, Male Atoll, Maldive Archipelago (Borradaile, 1917a), Salomon Island and Diego Garcia, Chagos Archipelago (Borradaile, 1917a), Pamban, Gulf of Manaar (Kemp, 1922), Krusadai Island,

Gulf of Manaar (Gravely, 1927), off Sentinel Island, Andaman Islands (Kemp, 1922), Port Blair, Andaman Islands (Kemp, 1922), Camorta Island, Nicobar Islands (Kemp, 1925), off Reed Point, Nancowry Island, Nicobar Islands (Kemp, 1925), Edam Island, Java Sea (De Man, 1888), Ternate (De Man, 1902), Amboina (De Man, 1888), Beagle Bay, Papua (Nobili, 1899), Northwest Islet, Capricorn Group, Queensland (McNeill, 1926), Great Barrier Reef (Stephenson, Stephenson, Tandy & Spender, 1931), Samoa (Pesta, 1914; Kemp, 1922; Boone, 1935), Savaii, Samoa Islands (Armstrong, 1941), Tahiti (Heller, 1865), Wake Island (Edmondson, 1925).

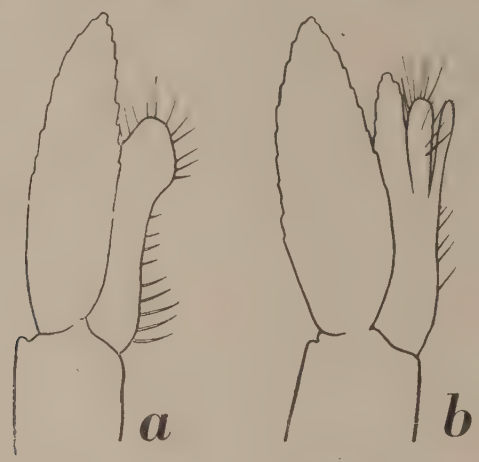


Fig. 30. *Periclimenes spiniferus* (De Man) ♂. a, first pleopod; b, second pleopod. a, b, × 56.

Periclimenes (*Harpilius*) *petitthouarsi* (Audouin)

Without name Savigny, 1809, Descr. Egypte, atlas, Crust., pl. 10 fig. 3.
Palaemon Petitthouarsii Audouin, 1825, Descr. Egypte, ed. 1, Hist. nat. vol. 1 pt. 4, p. 91.
Palaemon Petitthouarsii Audouin, 1827, Descr. Egypte, ed. 2 vol. 22, p. 276, atlas Crust., pl. 10 fig. 3.
Palemon Petithouarsii Roux, 1831, Mém. Class. Crust. Salic., p. 16.
Anchistia inaequimana Heller, 1861, Verh. zool.-bot. Ges. Wien, vol. 11, p. 28.
Anchistia inaequimana Heller, 1862, S. B. Akad. Wiss. Wien, vol. 44 pt. 1, p. 283.
non *Anchistia inaequimana* Heller, 1865, Reise Novara, Zool., vol. 2 pt. 3, p. 109.
Anchistia Petitthouarsii Paulson, 1875, Invest. Crust. Red Sea, p. 114.
Anchistia Petitthouarsi Kossmann, 1880, Zool. Ergebn. Reise Roth. Meeres, p. 83.
non *Anchistia petitthouarsi* ? Miers, 1884, Rep. zool. Coll. Alert, p. 293.
non *Anchistia Petitthouarsii* De Man, 1888, Arch. Naturgesch., vol. 53 pt. 1, p. 541.
Periclimenes Petitthouarsi Borradaile, 1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 381.
Periclimenes Petitthouarsi Nobili, 1901a, Annu. Mus. zool. Univ. Napoli, n. ser. vol. 1 pt. 3, p. 6.
Periclimenes Petitthouarsi Nobili, 1906, Bull. sci. France Belg., vol. 40, p. 41.
Periclimenes Petitthouarsii Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 49.
Periclimenes Petitthouarsi Lenz, 1912, Ark. Zool., vol. 7 pt. 29, p. 2.
Periclimenes Petitthouarsii Balss, 1915, Denkschr. Akad. Wiss. Wien, vol. 91 suppl., p. 25.
Periclimenes (*Falciger*) *petitthouarsi* Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 369.
Periclimenes petitthouarsii Tattersall, 1921, Journ. Linn. Soc. Lond. Zool., vol. 34, p. 385.
Periclimenes (*Ancylocaris*) *petitthouarsi* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 196.
Periclimenes petitthouarsi Balss, 1927, Trans. zool. Soc. Lond., vol. 22, p. 223.
Periclimenes petitthoursii Ramadan, 1936, Bull. Fac. Sci. Egypt. Univ., vol. 6, p. 22.

Museum Leiden

Jidda, Red Sea; 1881; leg. J. A. Kruyt. — 9 specimens (included ovigerous females) 14-18 mm.

The present specimens agree well with the descriptions and figure given in literature of this typical Red Sea species. The figure of Savigny is the only I could find in literature; this figure is so accurate that it hardly can be corrected, only the shape of the third maxilliped is not quite correct as has already been observed by Kossmann (1880).

The oral parts of the present species very strongly resemble those of the preceding. Also the first two pleopods of the male strongly resemble those of the previous species.

The specimen from Port Molle referred by Miers (1884) with some doubt to the present species, is specifically different from it; the specimen shows much affinity to *Periclimenes grandis*, but differs from that species in the shape of the second pereiopod.

The collection of the Museo Civico di Storia Naturale in Genoa possesses a specimen of this species from Arat Island, Red Sea.

Distribution. This litoral species is known from: Red Sea (Heller, 1861, 1862; Paulson, 1875; Kossmann, 1880; Balss, 1927), Egypt (Savigny, 1809; Audouin, 1825), Tor, Sinai Peninsula (Lenz, 1912; Balss, 1915; Kemp, 1922), Sherm Sheikh, Sinai Peninsula (Balss, 1915), Ghardaqa (Ramadan, 1936), Sherm Sheikh, Africa (Balss, 1915), Berenice, Halaib, Jidda, Raveiya, and Aqiq, Red Sea (Balss, 1915), Khor Dongonab, and Suakin Harbour (Tattersall, 1921), Eritrea (Nobili, 1901a, 1906b), Massawa (Nobili, 1906b; Balss, 1915), Kamaran Island (Balss, 1915), Jibuti (Nobili, 1906b), Perim (Nobili, 1906b), N.E. of Arzana Island, Gulf of Persia (Nobili, 1906). The species is restricted to the Red Sea and the Persian Gulf, in the rest of the Indo-Westpacific region it is represented by *Periclimenes spiniferus* De Man.

Periclimenes (*Harpilius*) *andamanensis* Kemp

Periclimenes (*Ancylocaris*) *andamanensis* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 204, figs. 54-57.
Periclimenes andamanensis Dammerman, 1929, Krakatau, p. 117.
Periclimenes andamanensis Dammerman, 1948, Verh. Kon. Nederl. Akad. Wetensch., sect. 2 vol. 44, p. 511, fig. 43.

Though the present species is not represented in the collections at hand, it is mentioned here as it is recorded in literature from Indonesia.

I am not quite convinced that the present species is distinct from *P. elegans*. The differences mentioned by Kemp are very small and based on characters, which in many species prove to be variable.

Distribution. The species is recorded by Kemp (1922) from Port Blair, Andaman Islands in depths between 3 and 8 fathoms. Dammerman (1929, 1948) in his papers on the new fauna of Krakatau mentions a specimen from a brackish water lake on Verlaten Island, a small islet situated in the Sunda Strait between Java and Sumatra. The specimen was identified by the late J. Roux.

Periclimenes (*Harpilius*) *grandis* (Stimpson)

Anchistia grandis Stimpson, 1860, Proc. Acad. nat. Sci. Philad., 1860, p. 39.
Anchistia ensifrons Müller, 1887, Verh. naturf. Ges. Basel, vol. 8, p. 471.

Anchistia ensifrons De Man, 1888, Arch. Naturgesch., vol. 53 pt. 1, p. 545.
Anchistia grandis Sharp, 1893, Proc. Acad. nat. Sci. Philad., 1893, p. 118.
Anchistia ensifrons Ortmann, 1894, Denkschr. med. naturw. Ges. Jena, vol. 8, p. 16.
Periclimenes grandis Borradaile, 1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 382.
Periclimenes ensifrons De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 826.
Periclimenes ensifrons Lenz, 1905, Abh. Senckenb. naturf. Ges., vol. 27, p. 380.
Periclimenes vitiensis Pearson, 1905, Rep. Ceylon Pearl Oyster Fish., vol. 4, p. 78.
Periclimenes ensifrons Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 49.
Periclimenes ensifrons Balss, 1915, Denkschr. Akad. Wiss. Wien, vol. 91 suppl., p. 26.
Periclimenes (Falciger) grandis Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 370.
Periclimenes (Ancylocaris) grandis Kemp, 1922, Rec. Indian Mus., vol. 24, p. 210, textfigs. 58, 59, pl. 7 fig. 10.
? *Periclimenes ensifrons* Sendler, 1923, Abh. Senckenb. naturf. Ges., vol. 38, p. 46.
Periclimenes grandis Balss, 1927, Trans. zool. Soc. Lond., vol. 22, p. 223.
Periclimenes (Ancylocaris) grandis Ramadan, 1936, Bull. Fac. Sci. Egypt. Univ., vol. 6, p. 22.
Periclimenes grandis Gurney, 1938, Sci. Rep. Great Barrier Reef Exped., vol. 6, p. 16, figs. 54-60.

Siboga Expedition

Station 225, 5700 m N, 279° E from southpoint of South Lucipara Island; reef; November 8, 1899. — 1 ovigerous female 23 mm.
Station 323, Sangkapura roads, Bawean Island; depth 12 m; bottom mud; February 24 and 25, 1900. — 1 specimen 17 mm.

Snellius Expedition

Beo, Karakelong, Talaud Islands; June 14-21, 1930. — 3 specimens 11-21 mm.

Museum Amsterdam

Berhala Island, off the eastcoast of Sumatra; December 26, 1929; leg. J. C. van der Meer Mohr. — 1 ovigerous female 18 mm.
Larantuka, Flores; June, 1909; leg. G. A. J. van de Sande. — 1 ovigerous female 24 mm.

The species is very closely related to *Periclimenes* (*Ancylocaris*) *elegans* (Paulson). The differences given by Kemp (1922) prove to be constant. In *P. elegans* the carpus of the second pereiopod bears an upper and an inner spine. In some specimens the inner spine is reduced, but the upper always is strong, at least stronger than the inner spine. In *P. grandis* only the inner spine is well developed, the upper is visible only as a rounded lobe. The species also is nearly related to *P. andamanensis* Kemp; in the characters mentioned by Kemp for the distinction of these two species my specimens entirely agree with *P. grandis*.

The oral parts are typical.

Distribution. This litoral species is recorded in literature from: Port Taufiq near Suez (Balss, 1927), Dahab, Red Sea (Balss, 1915), Ghardaqa, Red Sea (Ramadan, 1936; Gurney, 1938), Obok (Nobili, 1906b), Zanzibar (Lenz, 1905), Dar es Salaam (Ortmann, 1894), Pamban and Kilakarai,Gulf of Manaar (Kemp, 1922), Cheval Paar, Ceylon (Pearson, 1905; Kemp, 1922), S.E. of Modragam, Ceylon (Pearson, 1905), Cochin backwater near Ernakulam, S. India (Kemp, 1922), Trincomali (Müller, 1887), Paway Island, Mergui Archipelago (Kemp, 1922), Oshima, Japan (Stimpson, 1860), Chinese coast (Sharp, 1893), Ternate (De Man, 1902), Edam Island, Java Sea (De Man, 1888). A specimen of *Periclimenes* recorded by Sendler (1923) from

Palau was identified by Dr. d e M a n in 1914 as *P. ensifrons*; at that time the real differences between *P. ensifrons* and *P. grandis* were not yet clearly stated, so that it is possible that S e n d l e r's specimen in reality belongs to the present species.

Periclimenes (*Harpilius*) *elegans* (Paulson) (fig. 31)

Anchistia elegans Paulson, 1875, Invest. Crust. Red Sea, p. 113, pl. 17 fig. 1.
non *Periclimenes elegans* Gourret, 1884, Ann. Mus. Hist. nat. Marseille, vol. 2 mem. 2, p. 15.
Anchistia elegans Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 52.
? *Periclimenes elegans* Balss, 1915, Denkschr. Akad. Wiss. Wien, vol. 91 suppl., p. 26.
Periclimenes (Falciger) dubius Borradaile, 1915, Ann. Mag. nat. Hist., ser. 8 vol. 15, p. 211.
Periclimenes (Falciger) elegans Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 371.
Periclimenes (*Falciger*) *dubius* Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, pp. 324, 373, pl. 54 fig. 12.
Periclimenes (*Ancylocaris*) *elegans* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 215, textfigs. 60-62.
Periclimenes (*Ancylocaris*) *elegans* var. *dubius* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 218, textfig. 63.
Periclimenes (*Ancylocaris*) *elegans* Kemp, 1925, Rec. Indian Mus., vol. 27, p. 322.
Periclimenes (*Ancylocaris*) *elegans* var. *dubius* McNeill, 1926, Aust. Zool., vol. 4, p. 300.

Siboga Expedition

Station 129, anchorage off Kawio and Kamboling Islands, Kawio Group, N.E. of Celebes; reef; July 22 and 23, 1899. — 3 specimens (included one ovigerous female) 24-28 mm.
Station 152, Wunoh Bay, N.W. coast of Waigeo; reef; depth 32 m; Lithothamnion-bottom; August 12 and 13, 1899. — 1 specimen 14 mm.
Station 248, anchorage off Rumahlusi, northpoint of Tioor Island; reef; December 4 and 5, 1899. — 1 specimen 24 mm.
Station 273, anchorage off Djedan Island, eastcoast of Aru Islands; pearlbanks; depth 13 m; December 23-26, 1899. — 6 specimens (included ovigerous females) 14-22 mm.

Snellius Expedition

Mamudju, Celebes; shore and reef; August 4-5, 1929. — 4 specimens (included ovigerous females) 20-26 mm.
Ternate; pier, about 4 m; divinghood; April 1, 1930. — 1 specimen 16 mm.
Amboina; pier, 0-2 m; May 6, 1930. — 6 specimens (included ovigerous females) 14-22 mm.

Museum Leiden

Jidda; 1881; leg. J. A. Kruyt. — 3 specimens 16-21 mm.
Locality unknown. — 4 specimens 15-18 mm.

The oral parts are typical.

The first two pleopods of the male are figured here (figs. 31a, b).

The specimen from Siboga Station 152 is doubtfully referred to the present species; its correct identity could not be made certain as it lacks both second pereiopods. The specimen is infested on the legs with parasites, which probably are Rhizocephala.

Kemp (1922) separates specimens of the present species, which have the carpus of the second pereiopod three to barely four times as long as broad as a distinct variety *dubius* Borr. from the main species, which has the carpus four to four and a half times as long as broad. In my material the length of the carpus too is subject to variation, but I am not able to separate the specimens into two distinct groups and therefore I am inclined to consider the form *dubius* as a synonym of *elegans*, the more so as the differences mentioned by Kemp are extremely small and as in other species of the present genus the shape of the joints of the second pereiopod often are subject to a rather large variability.

Gourret (1884) in his study on the pelagic fauna of the Gulf of Marseilles mentioned a species under the name *Periclimenes elegans* Costa. As far as I know Costa never described a species

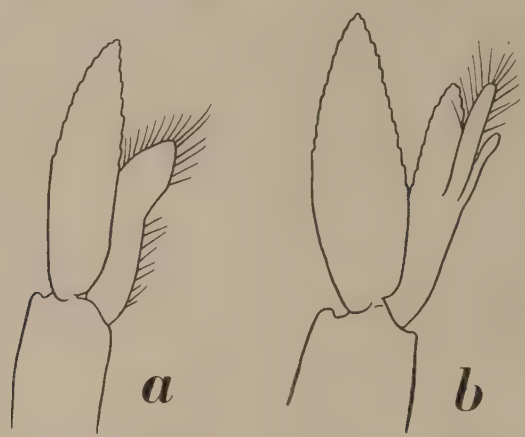


Fig. 31. *Periclimenes elegans* (Paulson) ♂. a, first pleopod; b, second pleopod. a, b, × 56.

under that name, and in my opinion it is most probable that Gourret by error used this name instead of *Periclimenes insignis* Costa (= *P. amethysteus* (Risso)). As, however, Gourret gave no further particulars about the species mentioned by him, the name *Periclimenes elegans* Gourret (1884) is a nomen nudum.

Distribution. This litoral species is reported in literature from: Red Sea (Paulson, 1875), Tor, Sinai Peninsula (Kemp, 1922), Koweit Harbour, Persian Gulf (Kemp, 1922), Minikoi (Borradaile, 1915, 1917a), Madras Harbour (Kemp, 1922), East Island, Andaman Islands (Kemp, 1922), Port Blair, Andaman Islands (Kemp, 1922), Camorta Island, Nicobar Islands (Kemp, 1925), Northwest Islet, Capricorn Group, Queensland (McNeill, 1926). It is doubtful whether Balss's (1915) specimen from St. John Island, Red Sea, belongs to the present species, as the carpus of his specimen is stated to be unarmed. The species now for the first time is recorded from the Malay Archipelago.

Periclimenes (*Harpilius*) *amymone* De Man (fig. 32)

Periclimenes amymone De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 829, pl. 25 fig. 53.
Periclimenes (Falciger) amymone Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 371.
Periclimenes (*Ancylocaris*) *amymone* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 219.
Periclimenes (*Ancylocaris*) *amymone* Kemp, 1925, Rec. Indian Mus., vol. 27, p. 326.
Periclimenes (*Ancylocaris*) *amymone* Armstrong, 1941, Amer. Mus. Novit., n. 1137, p. 12.

Siboga Expedition

Station 78, Lumulumu Shoal, Borneo Bank; reef; June 10 and 11, 1899. — 2 specimens 14 and 18 mm.

Snellius Expedition

Kera near Timor; November 11-13, 1929. — 19 specimens 11-19 mm.
Obi latu; shore and reef; April 27, 1930. — 5 specimens 12-22 mm.

The specimens agree with De Man's description. In the specimens in which both second pereiopods are present, one is much longer and stouter than the other, also differing from it in the dentition of the cutting edge of the fingers, which in the smaller pereiopod is just like that described by De Man. The stronger pereiopod (fig. 32) has the posterior half of the cutting edge of the dactylus provided with about four teeth, the most distal of which is largest, the three proximal being much smaller; distally of the large tooth the cutting edge presents a deep gap, which is provided at the anterior end with a small distinct tooth; between this tooth and the curved apex of the dactylus the cutting edge is straight and entire. The fixed finger, like the dactylus, is provided with a gap, which anteriorly ends in a small tooth; behind this gap two to five teeth are present, the proximals of which often are very small. This feature is mentioned also by Kemp (1925).

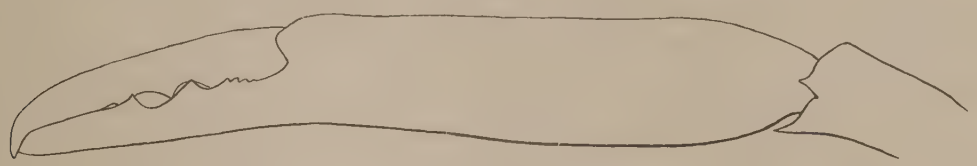


Fig. 32. *Periclimenes amymone* De Man. chela of second pereiopod. × 18.

The rostrum in my specimens is provided dorsally with 6 to 8 teeth, ventrally with 2 to 4, in an abnormal specimen the rostral formula is $\frac{5}{0}$.

The telson dorsally is provided with two pairs of spinules, the anterior of which is placed slightly before the middle of the telson, the posterior midway between the anterior pair and the posterior margin of the telson.

The oral parts are quite typical.

The first two pleopods of the male do not differ from those of *P. elegans.*

In the specimens from the Snellius Expedition the tips of the fingers in the second pereiopods are coloured brown, this feature is no more visible in the very much older Siboga specimens; it probably is a remainder of the original colourpattern of the animals.

One of the specimens from Kera is provided with a Bopyrid parasite.

Distribution. This litoral species in literature has been recorded from: Octavia Bay, Nancowry Harbour, Nicobar Islands (Kemp, 1925), Ternate (De Man, 1902), Savaii, Samoa Islands (Armstrong, 1941).

Periclimenes (*Harpilius*) *demani* Kemp

Periclimenes demani Kemp, 1915, Mem. Indian Mus., vol. 5, p. 279, textfig. 27, pl. 13 fig. 10.
Periclimenes (*Ancylocaris*) *demani* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 219, fig. 64.

Museum Amsterdam

Chilka Lake, Orissa coast; ? syntypes. — 3 specimens 20-23 mm.

The present specimens, in all probability syntypes of this species, were presented by the Chilka Survey to Dr. J. G. d e M a n, whose collection after his death in 1931 was transferred to the Zoological Museum at Amsterdam.

Distribution. This litoral species, which lives in brackish as well as in pure seawater, is recorded from: Chilka Lake (K e m p, 1915), Adyar River and Ennur backwater near Madras (K e m p, 1915), Jack and Una Island, Mergui Archipelago (K e m p, 1922).

Periclimenes (*Harpilius*) *tenuipes* Borradaile

Periclimenes tenuipes Borradaile, 1898b, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 384.
Periclimenes tenuipes Borradaile, 1899, Willey's Zool. Res., p. 406, pl. 36 fig. 2.
non *Periclimenes tenuipes* Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 235.
non *Anchistia tenuipes* Holmes, 1900, Occ. Pap. California Acad. Sci., vol. 7, p. 216.
non *Periclimenes tenuipes* Rathbun, 1904, Harriman Alaska Exped., vol. 10, p. 34, fig. 12.
Periclimenes borradailei Rathbun, 1904, Harriman Alaska Exped., vol. 10, p. 34.
non *Periclimenes Borradailei* Nobili, 1905, Bull. Mus. Hist. nat. Paris, vol. 11, p. 159.
Periclimenes borradailei Nobili, 1907a, Annu. Mus. zool. Univ. Napoli, ser. 2 vol. 2 pt. 21, p. 5.
Periclimenes (*Falciger*) *kolumadulensis* Borradaile, 1915, Ann. Mag. nat. Hist., ser. 8 vol. 15, p. 213.
Periclimenes (*Falciger*) *kolumadulensis* Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, pp. 324, 376, pl. 54 fig. 17.
Periclimenes (*Falciger*) *borradailei* Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, pp. 324, 372.
non *Periclimenes tenuipes* Schmitt, 1921, Univ. Calif. Publ. Zool., vol. 23, p. 39, fig. 24.
Periclimenes (*Ancylocaris*) *tenuipes* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 220, pl. 8 fig. 11.
non *Periclimenes tenuipes* Schmitt, 1924, Proc. Calif. Acad. Sci., ser. 4 vol. 13, p. 386.

Siboga Expedition

Station 7, near reef of Badjulmati, E. Java, 7° 55'.5 S, 114° 26' E; dredge and shore exploration; depth 15 m and more; bottom coral and stones; March 11, 1899. — 1 ovigerous female 26 mm (damaged).

Station 71, Makassar; dredge, townet and shore exploration; depth up to 32 m; bottom mud, sand with mud and coral; May 10 till June 7, 1899. — 1 ovigerous female 24 mm.

Station 240, Banda anchorage; trawl, dredge and reef exploration; depth from 9 to 45 m; bottom black sand and coral, lithothamnion bank in 18-36 m; November 22 till December 1, 1899. — 1 ovigerous female 27 mm.

Station 285, anchorage southcoast of Timor, 8° 39'.1 S, 127° 4'.4 E; dredge; depth 34 m; bottom on the limit between mud and coral, lithothamnion; January 18, 1900. — 1 specimen 24 mm.

The specimens at my disposal entirely agree with K e m p's excellent description. The specimen from Station 285 is provided with parasites, which probably belong to the Rhizocephala.

The oral parts of the species are typical.

The first two pleopods of the males do not differ from those of *P. americanus*.

The specimens from Beagle Bay brought by N o b i l i (1899) to the present species were examined by me in the Museo Civico di Storia Naturale in Genoa, Italy. One of the specimens proved

to be an ovigerous female of *Periclimenes seychellensis*, the two other specimens are *Leander tenuicornis* (Say).

Distribution. In literature the species is recorded from: Mahé, Seychelles (Kemp, 1922), Kolumadulu Atoll, Maldive Archipelago (Borradaile, 1915, 1917a), Haddumati Atoll, Maldive Archipelago (Borradaile, 1917a), off Ceylon, 6° 01′ N, 81° 16′ E (Kemp, 1922), Port Blair, Andaman Islands (Kemp, 1922), Ralun, New Britain (Borradaile, 1898a, 1899). The species is litoral, the greatest depth from which it is recorded is 60 m.

Periclimenes (*Harpilius*) *platycheles* nov. spec. (fig. 33)

Siboga Expedition

Station 149, anchorage off Fau Island, westcoast of Gebe Island; reef; depth 31 m; August 10 and 11, 1899. — 1 ovigerous female 15 mm.

Station 169, anchorage off Atiationin, westcoast of New Guinea; trawl, dredge, townet and reef exploration; depth up to 57 m; bottom mud; August 23-25, 1899. — 1 specimen 16 mm.

The rostrum is slender and reaches slightly beyond the scaphocerite, the apex is slightly curved upward. The upper margin bears seven teeth, while the lower is provided with five or six. The first dorsal tooth is placed on the carapace behind the orbit, it stands slightly closer to the second tooth than the third. The second tooth is placed just over the orbit; the other teeth are regularly divided over the rostrum. Both upper and lower margin of the rostrum are provided with setae. The carapace is smooth and provided with antennal and hepatic spines only. The antennal spine is situated slightly below the rounded lower angle of the orbit; the hepatic spine is placed behind the antennal on a slightly lower level. The anterolateral angles of the carapace are rounded.

The abdomen is smooth; the pleurae of the first four segments are rounded, that of the fifth ends in a sharp posteriorly directed point. The third segment is a little produced in the median part of the posterior margin. The sixth segment is $1^1/_2$ times as long as the fifth.

The telson is somewhat longer than the sixth abdominal segment. The dorsal surface is provided with two pairs of spinules; the first pair is situated slightly before the middle of the telson, the other lies midway between the first pair and the posterior margin of the telson. This posterior margin is provided with three pairs of spinules, the intermediate of which is very long.

The eyes are well developed. The cornea is hemispherical, as broad as and slightly shorter than the stalk, it is provided with two bands of black pigment. The ocellus is distinct.

The basal segment of the antennular peduncle is broad; the stylocerite is short and rather broad, it fails to reach the middle of the basal segment. The anterolateral spine of the basal segment is very small, greatly failing to reach the middle of the second segment. The anterior margin of the basal segment is almost straight. The second segment is slightly shorter and broader than the third, together they are about half as long as the basal segment. The fused part of the two rami of the upper antennular flagellum consists of about 20 segments, being about twice as long as the antennular peduncle. The free part of the shorter ramus is extremely short.

The scaphocerite reaches with slightly less than half its length beyond the antennular peduncle;

it is narrow, the anterior margin is truncate, the outer margin strongly concave. The final tooth reaches beyond the lamella. A strong spine is present on the basal part of the antennal peduncle.

The oral parts show no important differences from those of the preceding species. The third

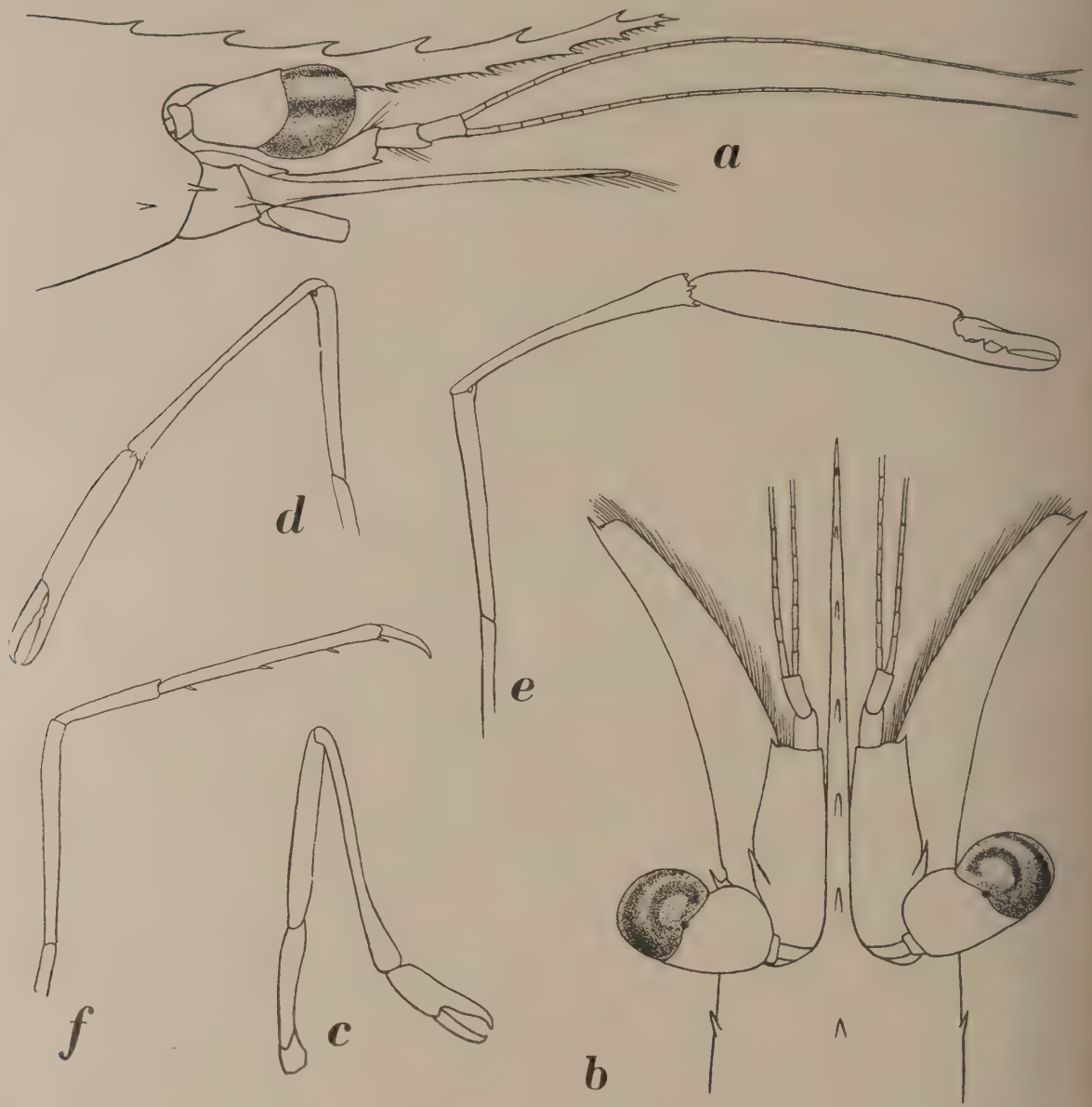


Fig. 33. *Periclimenes platycheles* nov. spec. a, anterior part of body, lateral view; b, anterior part of body, dorsal view; c, first pereiopod; d, right second pereiopod; e, left second pereiopod; f, third pereiopod. a-c, f, × 18; d, e, × 12.

maxilliped fails to reach the end of the antennal peduncle. The ultimate segment measures $^2/_3$ of the penultimate; the antepenultimate segment is longest, it is slightly overreached by the exopod.

The first pereiopod (fig. 33c) is slender, it reaches with the entire chela beyond the scaphocerite. The chela is broad, the fingers are only slightly longer than the palm, they are broad, with convex upper and lower margins; the cutting edge is entire. The palm is less than twice as long as

broad. The chela shows the same robust shape as may be observed in species as *P. petitthouarsi*, *P. spiniferus*, and other species which have the fingers pectinate, but this pectination is absent here. Some tufts of setae are present on the fingers. The carpus is twice as long as the chela, it is slender and anteriorly broadened. The merus is shorter than the carpus, but distinctly broader. The ischium is as long as the chela. The second pereiopods (figs. 33d, e) are unequal and slender, they reach with the carpus and the chela beyond the scaphocerite. The left pereiopod has the fingers about half as long as the palm; both dactylus and fixed finger are provided with two broad teeth in the proximal part of the cutting edge. The teeth of the dactylus are placed slightly before those of the lower finger; between the two teeth a distinct excavation is visible. The upper margin of the dactylus is provided with a flange along the external side, like in *Periclimenes* (*Periclimenes*) *latipollex*. The carpus is about as long as the palm, it is broadened anteriorly and has the anterior margin provided with two distinct spines, one at the lower and one at the inner side. The merus is almost as long as the carpus and ends in a distinct anteroventral tooth. The ischium is shorter than the merus. The right leg is shorter than the left, the teeth of the chela are less conspicuous than in the left leg, the carpus is much longer than the chela and than the merus, the ischium is longer than the merus. The last three pereiopods are slender, all reaching slightly beyond the scaphocerite. The dactylus in the third leg (fig. 33f) is simple, curved and slender. The propodus is about four times as long as the dactylus and has the posterior margin provided with some spinules, the most distal of which is the strongest. The carpus is about half as long as the propodus and as long as the ischium. The merus is about as long as the propodus. The fourth and fifth legs are similarly shaped as the third.

The uropods are longer than the telson, but the endopod does not reach the end of the intermediate pair of spinules of the posterior margin of the telson. The exopod has the outer margin straight, provided with a row of setae along the lower border and ending into two teeth.

The present species is most closely related to *P. tenuipes* Borr., but differs from it in the shorter rostrum, which is provided with less teeth, in the broad chela of the first pereiopods, in the entirely different shape of the fingers of the second pereiopods, in the presence of two strong spines at the anterior margin of the carpus of the second pereiopod, in the different relation between the joints of these pereiopods and in the last three pereiopods, which have the propodus not subdivided.

Periclimenes (Harpilius) digitalis Kemp (fig. 34)

Periclimenes (*Ancylocaris*) *digitalis* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 224, textfig. 65, pl. 8 fig. 12.

Siboga Expedition

Station 43, Saraso Island, Postiljon Group, Flores Sea; dredge and Hensen vertical net; depth up to 36 m; bottom coral; April 4 and 5, 1899. — 1 ovigerous female 15 mm.

The present specimen agrees in all important points with Kemp's description and figures. The rostrum bears 8 teeth above and 2 below. The vestigial supraorbital spine is lacking in my specimen, but a distinct supraorbital ridge is present. The exopod of the third maxilliped reaches somewhat beyond the antepenultimate segment. The second pereiopod in my specimen is slightly shorter than that described by Kemp, it only reaches with the chela and part of the carpus beyond the scaphocerite.

The oral parts are typical in shape, only the inner lacinia of the maxilla (fig. 34) has the lower lobe very much shorter than the upper lobe; both lobes are rather short and broad.

Distribution. The only record of this species in literature is that of Kemp, who reports it from Port Blair, Andaman Islands, from a depth of 5.5 to 9 m.

Fig. 34. *Periclimenes digitalis* Kemp. maxilla. × 25.

Periclimenes (*Harpilius*) *brocki* (De Man)

Anchistia Brockii De Man, 1888, Arch. Naturgesch., vol. 53 pt. 1, p. 548, pl. 22a fig. 3.
Periclimenes Brocki Borradaile, 1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 383.
Periclimenes (*Cristiger*) *brocki* Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, pp. 324, 363, pl. 53 and 54 fig. 8.
Periclimenes (*Ancylocaris*) *brocki* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 226.

The species is not represented in the collections at hand.

Kemp (1922), who examined a specimen from Suvadiva Atoll, which was identified by Borradaile with De Man's species, states that he has nothing to add to De Man's description. Kemp placed the species in the second section of the subgenus *Ancylocaris,* which is characterized by the presence of an anteroventral tooth at the merus of the second pereiopod, while De Man in his description of the second pereiopod states: "Sämmtliche Glieder sind glatt, gänzlich unbewehrt, und zeigen weder Zähne noch Stacheln". According to De Man's description therefore the species has to be placed in the first section of the subgenus. Also Borradaile (1917a) states that in the subgenus *Cristiger,* in which he placed De Man's species, the second leg is unarmed, except in *Periclimenes* (*Cristiger*) *gracilis.*

Distribution. *Periclimenes brocki* is recorded from: Suvadiva Atoll, Maldive Archipelago (Borradaile, 1917a; Kemp, 1922), and from Amboina (De Man, 1888). The specimen from the Maldive Archipelago was collected at a depth of up to 78 m, it was associated with a seaurchin.

Periclimenes (*Harpilius*) *lutescens* (Dana) (fig. 35)

Harpilius lutescens Dana, 1852, Proc. Acad. nat. Sci. Philad., 1852, p. 25.
Harpilius lutescens Dana, 1852a, U.S. Explor. Exped., vol. 13, p. 576.
Harpilius lutescens Weitenweber, 1854, Lotos Praha, vol. 4, p. 37.
Harpilius lutescens Dana, 1855, U.S. Explor. Exped., vol. 13 atlas, p. 12, pl. 37 fig. 4.
Harpilius lutescens De Man, 1888, Arch. Naturgesch., vol. 53 pt. 1, p. 536.
Harpilius lutescens Borradaile, 1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 386.
Harpilius lutescens Nobili, 1901a, Annu. Mus. zool. Univ. Napoli, n. ser. vol. 1 pt. 3, p. 3.
Harpilius lutescens Thompson, 1901, Catal. Crust. Mus. Dundee, p. 19.
Harpilius consobrinus De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 836, pl. 26 fig. 54.

Harpilius lutescens Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 63.
Harpilius consobrinus Balss, 1915, Denkschr. Akad. Wiss. Wien, vol. 91 suppl., p. 27.
Harpilius lutescens Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 381.
Harpilius consobrinus Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 381.
Harpilius depressus Tattersall, 1921, Journ. Linn. Soc. Lond. Zool., vol. 34, p. 389, pl. 28 fig. 7.
? *Harpilius lutescens* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 235, figs. 72, 73.
Harpilius consobrinus Kemp, 1922, Rec. Indian Mus., vol. 24, p. 237.
? *Harpilius lutescens* Boone, 1935, Bull. Vanderbilt mar. Mus., vol. 6, p. 167, pl. 45.

Siboga Expedition

Station 78, Lumulumu Shoal, Borneo Bank; reef; depth 34 m; bottom coral and coralsand; June 10 and 11, 1899. — 2 specimens (one of which ovigerous) 15 and 17 mm.

Snellius Expedition

Kera near Timor; November 11-13, 1929. — 1 specimen 18 mm.
Amboina; shore and reef; divinghood; depth 0-2 m; May 6, 1930. — 1 ovigerous female 17 mm.
Ake Selaka, Kau Bay, Halmahera; shore and reef; May 28, 1930. — 1 ovigerous female 22 mm.
Beo, Karakelong, Talaud Islands; depth 6-10 m; June 14-21, 1930. — 4 specimens (included ovigerous female) 11-17 mm.
Ternate, pier; divinghood; depth about 4 m; August 1, 1930 [1]). — 1 ovigerous female 18 mm.

Museum Amsterdam

Sinabang, Simalur, off the westcoast of Sumatra; February and March, 1913; leg. E. Jacobson. — 2 specimens 23 and 24 mm.

All oral parts of the present species are figured here (figs. 35a-e), they are rather typical. The first maxilliped has the palp rather short; the second maxilliped differs from most other species by having the last joint long and narrow, being about of the same width over its entire length.

The first two pleopods of the male are figured here too (figs. 35f, g), they show no essential differences from those of the other species of the present subgenus.

Kemp (1922) considered the present species to be the type of a separate genus *Harpilius,* which included the species *H. lutescens, H. gerlachei, H. beaupresi* and *H. depressus.* As Kemp already stated the genus was closely related to *Periclimenes,* differing only in the more depressed shape, which, however, showed a large variation within the genus, and in other characters, which varied in both genera; he therefore remarked that it was not improbable that the two genera had to be fused. In 1917 Borradaile had placed the species united by Kemp in the genus *Harpilius* in two separate genera, *Harpiliopsis* and *Harpilius. Harpiliopsis* contained the species *H. beaupresi* and *H. depressus, Harpilius* consisted of the two other species. According to Borradaile the two genera differ in the shape of the second maxilliped and in the presence or absence of an arthrobranch on the third maxilliped. The first difference is based, as already pointed out by Tattersall (1921) and Kemp (1922), on the incorrect figure of Dana of the second maxilliped of *H. lutescens;* the second difference was based on a statement of Sollaud (1910) that in *Harpilius* the arthrobranch of the third maxilliped is absent; Sollaud does not mention, which species he examined but this obviously is *H. gerlachei* as that species is the only member of *Harpilius* s.l. without this arthrobranch.

1) This date probably is incorrect as the Snellius Expedition on August 1, 1930 was not in Ternate, but in Surabaya.

The differences mentioned by Borradaile thus are quite erroneous, therefore Tattersall (1921) as well as Kemp (1922) considered *Harpiliopsis* a synonym of *Harpilius*. In my opinion *Harpiliopsis* indeed must be separated from *Harpilius*, though on other characters than those mentioned by Borradaile (1917a); the most important of these characters are the very strongly depressed shape of the body in *Harpiliopsis* and the fact that in that genus the pleurae of the fourth and fifth abdominal segments are strongly pointed inferiorly; also the second pereiopods show an

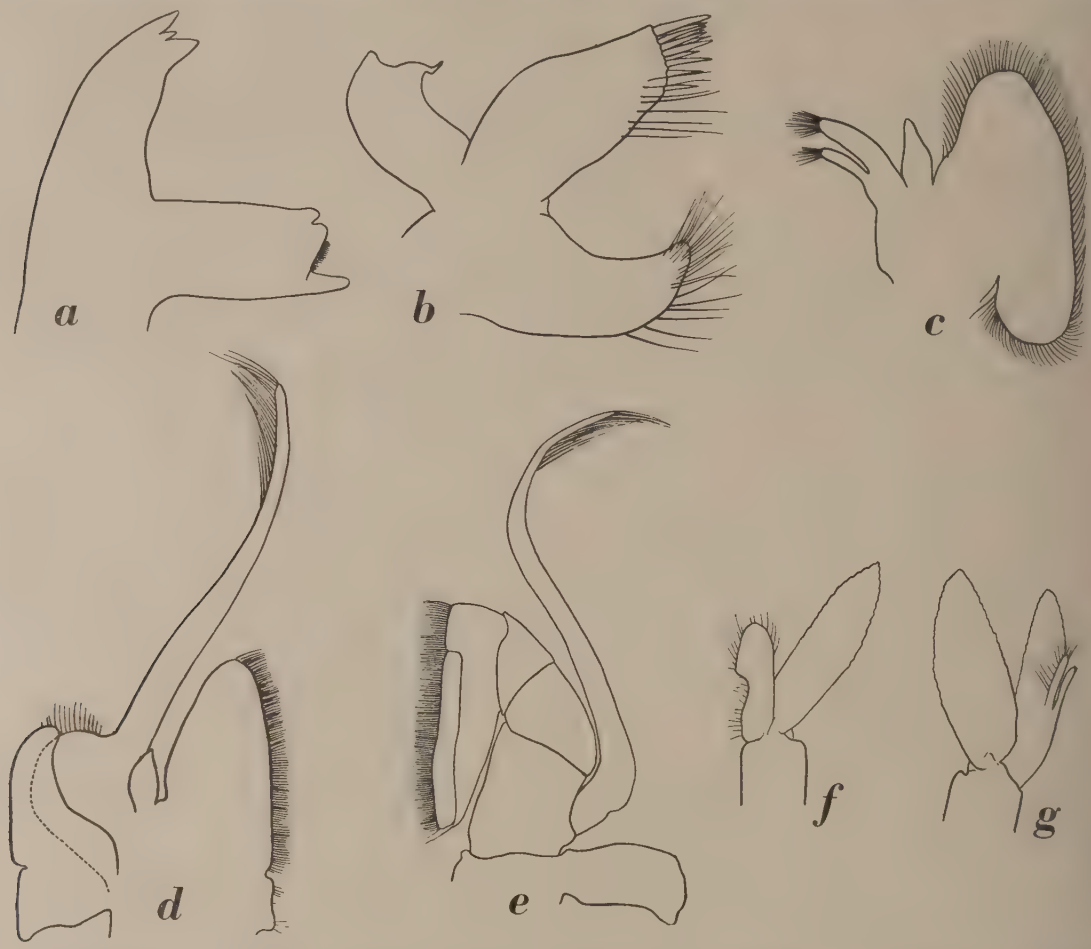


Fig. 35. *Periclimenes lutescens* (Dana). a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, first pleopod of male; g, second pleopod of male. a, b, × 50; c-g, × 21.

entirely different shape. *Harpilius lutescens* in my opinion can not be separated from *Periclimenes* and therefore is now inserted in that genus. For the fourth species of Kemp's *Harpilius*, *H. gerlachei* a new genus is erected here as the species shows some features, which make it impossible to place it in one of the known genera.

My specimens agree in all important points with Kemp's (1922) description of the specimens, which he with some doubt refers to *Harpilius lutescens*. The rostrum in my specimens bears 7 or 8 dorsal teeth, the lower margin of it is provided with 2 or 3 teeth. The differences of Kemp's and my specimens with Dana's figure, in all probability are due to inaccuracy of the latter and I do not hesitate therefore to identify the specimens with Dana's species.

According to Kemp (1922) *Harpilius consobrinus* De Man is closely related to the present species, but nevertheless is distinct. Kemp mentions some minor differences between the two species, the most important being the fact that in *H. consobrinus* the hepatic spine is situated on the anterior margin of the carapace, while in *H. lutescens* it is remote from that margin. This difference, however, does not exist; Kemp wrongly interpreted De Man's (1902) description. De Man (1902, p. 837) states namely: „Bei allen Exemplaren trägt der Cephalothorax ... einen ... nach aussen gerichteten Hepaticalstachel, der ein wenig unter dem ersteren [the antennal spine] liegt, aber nicht weit vom Vorderrande." In the description of specimens which he in 1888 brings to *Harpilius lutescens,* but which in his 1902 description of *H. consobrinus* are included in the latter species, De Man (1888, p. 537) states: „Der Vorderrand des Cephalothorax trägt einen kleinen Antennalstachel; ein wenig unter diesem Stachel und auf geringer Entfernung vom Vorderrande bemerkt man einen zweiten Stachel, den Hepaticalstachel". From these two sentences it is clear that in *H. consobrinus* the hepatic spine is not placed on the anterior margin, but is slightly remote from it. Kemp in all probability based his statement on the following sentence in De Man's (1902, p. 837) description: „Betrachtet man die Cephalothorax von oben, so entspringt die Spina hepatica unmittelbar am Seitenrande des Rückenschildes, bei *Harp. lutescens* dagegen erscheint sie in dieser Lage ein wenig vom Seitenrande entfernt (Dana, Fig. 4c). Dies ist ein wichtiger Unterschied zwischen beiden." Here De Man means to indicate that *H. lutescens* is more depressed than *H. consobrinus* and that in dorsal view therefore the hepatic spine in *H. lutescens* is remote from the lateral (not anterior!) margin of the carapace, while in *H. consobrinus* in dorsal view the hepatic spine is situated just on the lateral margin of the carapace. My specimens, and probably also those of Kemp, have this feature in common with De Man's specimens. In my opinion therefore there is no reason to separate *H. lutescens* and *H. consobrinus,* which in consequence are considered here to be synonyms. The other differences mentioned by Kemp for distinguishing the two species namely are so small that they fall within the range of variability of the species.

Boone's (1935) specimens differ from the specimens at hand in the longer fingers of the second legs, in the longer ischium of the same appendage, in the slenderer last three pereiopods and in the different shape of the rostrum; in the figure furthermore the anterolateral angle of the carapace is not rectangular, a carina is indicated behind the antennal spine and the scaphocerites are drawn broader than they are in my specimens of the present species. It is possible therefore that Boone's specimens do not belong to *Periclimenes lutescens.*

Distribution. The species is associated with Madreporaria. In literature it is recorded from: Tor, Sinai Peninsula (Balss, 1915), Ras Abu Somer, Dahab and Yenbo, Red Sea (Balss, 1915), Suakin, Red Sea (Tattersall, 1921; Kemp, 1922), Eritrea (Nobili, 1901a; 1906b), Noordwachter Island, Java Sea (De Man, 1888), Ternate, Moluccas (De Man, 1902), Tongatabu, Tonga Archipelago (Dana, 1852), Samoa (Thompson, 1901), Venus Point Reef, Tahiti ? (Boone, 1935), Anaho Bay, Nuka Hiva, Marquesas Islands? (Boone, 1935).

Paranchistus nov. gen.

Definition: Pontoniid prawns living endozootic within Lamellibranchia. The body is clumsy, but not depressed. The rostrum is well developed, compressed and provided with small teeth near

the apex. The carapace is smooth, it is provided with an antennal and a hepatic spine at either side. The hepatic spine is movable.

The abdomen is smooth, not geniculate. The pleurae of the first four segments are broadly rounded. The sixth segment is short.

The telson is elongate, the upper surface is provided with 2 pairs of small spines; the posterior margin bears three pairs of spines.

The eyes are well developed, normal in shape, with the cornea hemispherical.

The basal segment of the antennular peduncle is broad, the stylocerite is rather broad and often blunt. The last two segments of the peduncle are short. The upper flagellum ends in two rami.

The scaphocerite is large, broadly ovate. The antennal peduncle bears no spine.

The mandible bears no palp. The incisor process ends in three teeth, the molar process is provided with blunt knobs and ridges, brushlike arranged spines are present on the molar process. The maxillula has the inner lacinia slender or broadened, the palp is bilobed or entire. The maxilla is provided with a distinctly bilobed inner lacinia, the lobes may be broad or narrow; the scaphognathite is large, but not very broad. The first maxilliped resembles strongly that of the species of *Periclimenes*, the palp is well developed, the caridean process of the exopod is of varying breadth, the separation of the coxa and basis is more or less distinct. The second maxilliped is normal in shape, no podobranch is present. The third maxilliped is slender, it is provided with an arthrobranch. Exopods are present on all maxillipeds.

The first pereiopods are slender; the carpus and merus are of about the same length, being much longer than the other joints. The second pereiopods are equal in shape, the palm is cylindrical, not much swollen; the fingers are elongate, slender, with small teeth on the cutting edge. The last three pereiopods are slender; the dactylus is biunguiculate or simple, sometimes provided with horny tubercles.

The endopod of the first pleopod of the male bears a broad distally directed tooth at the end of the inner margin. The second pleopod of the male has the appendix masculina slightly shorter than the appendix interna.

Uropods broad.

Type: *Anchistus biunguiculatus* Borradaile.

The genus is closely related to *Anchistus* Borr. The most important difference between the two genera is the fact that in *Paranchistus* the hepatic spine is present, while this spine is lacking in *Anchistus*.

Three species may be referred to the present genus, two of them are new to science, both originating from the western part of the Indian Ocean; the third species is known from the Malay Archipelago. These three species, all of which are represented in the present collections, may be separated as follows:

1. Rostrum gradually narrowing towards the top, distinctly curved downward. Cutting edges of the fingers of the first pereiopods pectinate. Dactyli of the last three pereiopods not flattened anteriorly 2
— Rostrum somewhat broadening near the apex, straight or slightly curved downward. Cutting edges of the fingers of the first pereiopods entire. Dactyli of the last three pereiopods flattened anteriorly, biunguiculate . . . . . *nobilii*

2. Dactylus of second pereiopod much longer than fixed finger, curved into a hook at the apex. Dactyli of last three pereiopods biunguiculate, without horny tubercles . . . . . *biunguiculatus*
— Dactylus of second pereiopod of about the same length as the fixed finger, not strongly hookshaped. Dactyli of last three pereiopods simple, provided with horny tubercles . . . . . *ornatus*

Paranchistus biunguiculatus (Borradaile) (figs. 36-38)

Anchistus biunguiculatus Borradaile, 1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 387.
Anchistus biunguiculatus Borradaile, 1899, Willey's Zool. Res., vol. 4, p. 408, pl. 36 fig. 5.
Tridacnocaris biunguiculata Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 235.
Anchistus biunguiculatus Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 388.
Anchistus oshimai Kubo, 1949a, Bull. biogeogr. Soc. Japan, vol. 14, p. 26, figs. 1, 2.

Snellius Expedition

Obi latu; shore and reef; April 23-27, 1930. — 1 specimen 24 mm.

The rostrum is compressed and directed downward, it reaches the middle of the second segment of the antennular peduncle. The upper margin of the rostrum is obscurely serrate in the distal half, the tip is slightly emarginate. The lower margin is slightly convex, entire and provided with setae. The ventral part of the base of the rostrum is broadened and projects over the bases of the eyestalks. The carapace is smooth. The lower orbital angle is rather broad and pointed. The antennal spine is placed some distance below the lower orbital angle, it is rather strong. The hepatic spine is small and movable, it is placed much behind the antennal spine and at a lower level. The anterolateral angle of the carapace is rounded.

The abdomen is smooth. The pleurae of the first five segments are broadly rounded. The sixth abdominal segment is proportionately short and high, being only a little longer than the fifth segment.

The telson (fig. 36c) is about $1^1/_2$ times as long as the sixth abdominal segment, it is rather high at its base. The dorsal surface of the telson is provided with two pairs of small spinules, which are placed in the posterior third of it. The posterior pair lies midway between the anterior pair and the posterior margin of the telson. This posterior margin is provided with three pairs of spinules, the intermediate of which is longest; the outer pair is $^1/_3$ to $^1/_2$ as long as the intermediate, while the submedian spines are more than half as long as the intermediates.

The eyes are well developed. The cornea is hemispherical, it is narrower and much shorter than the stalk. The ocellus is fused with the cornea, and it is distinct.

The first segment of the antennular peduncle is very broad. The stylocerite is small and ends in a blunt point, it does not reach the middle of the first segment of the peduncle. The outer margin of the first segment is straight or slightly convex and ends in a minute spine; the anterior margin is strongly convex, reaching beyond the anterolateral spine. The second segment is broader and shorter than the third, its lateral part reaches as a rounded lobe beyond the articulation with the third segment. The second and third segments together measure about $^2/_3$ of the length of the first segment. The upper antennular flagellum has the two rami fused for 6 joints; the free part of the shorter ramus consists of 3 joints, it is shorter than half the fused portion.

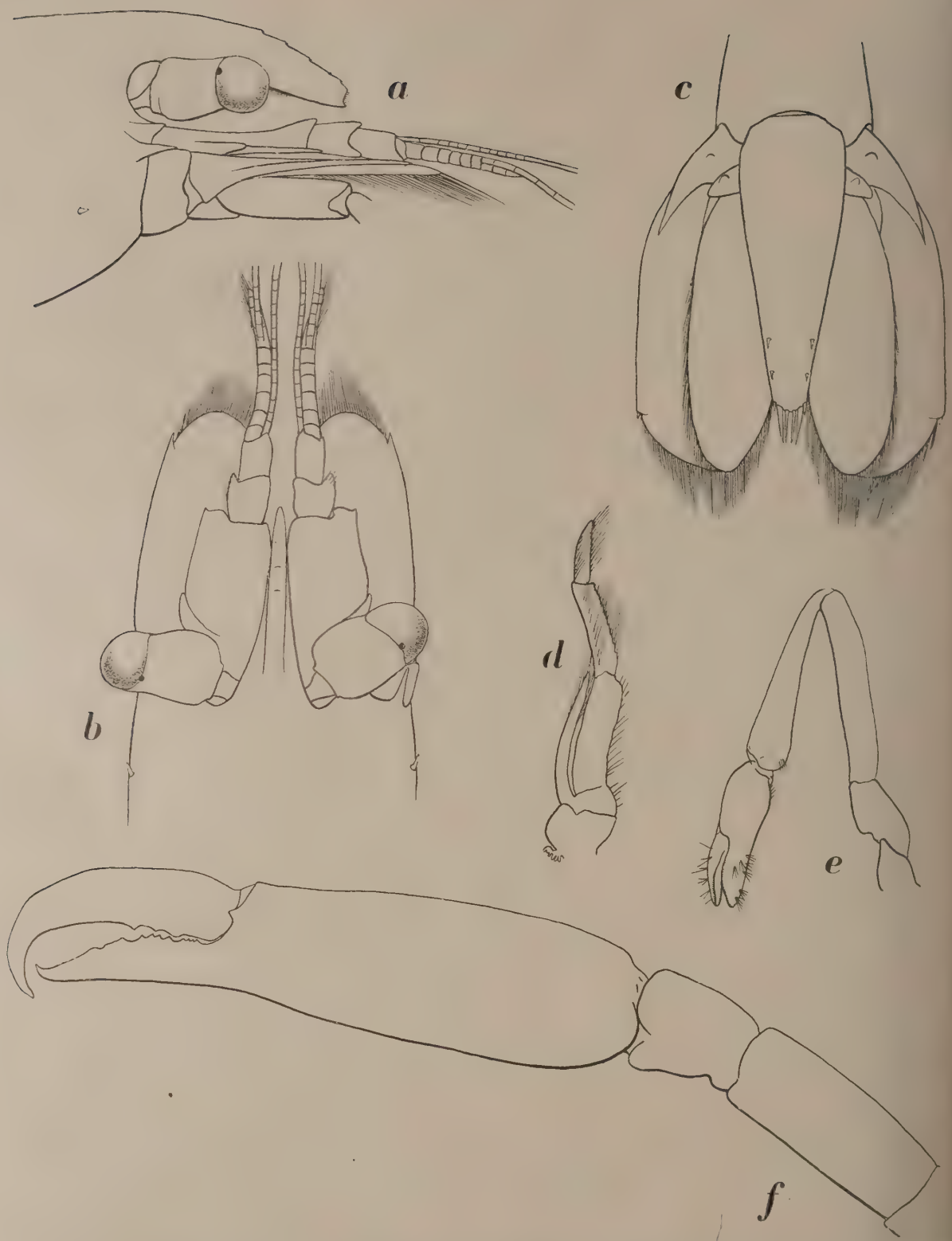


Fig. 36. *Paranchistus biunguiculatus* (Borr.). a, anterior part of body, lateral view; b, anterior part of body, dorsal view; c, telson and uropods, dorsal view; d, third maxilliped; e, first pereiopod; f, second pereiopod. a-e, × 15.

The scaphocerite reaches distinctly beyond the antennular peduncle, it is broad and has the anterior margin rounded. The outer margin is convex and ends in a strong tooth, which is overreached by the lamella. The antennal peduncle does not possess a spine.

The mandible (fig. 37a) is typical. The maxillula (fig. 37b) has the inner lacinia slender; the palp has the upper lobe indistinct. The inner lacinia of the maxilla (fig. 37c) is deeply cleft, the two lobes are narrow, the lower being narrower than the upper. The first maxilliped (fig. 37d) has the caridean process broad. The second maxilliped of the specimen from Obi latu (fig. 37e)

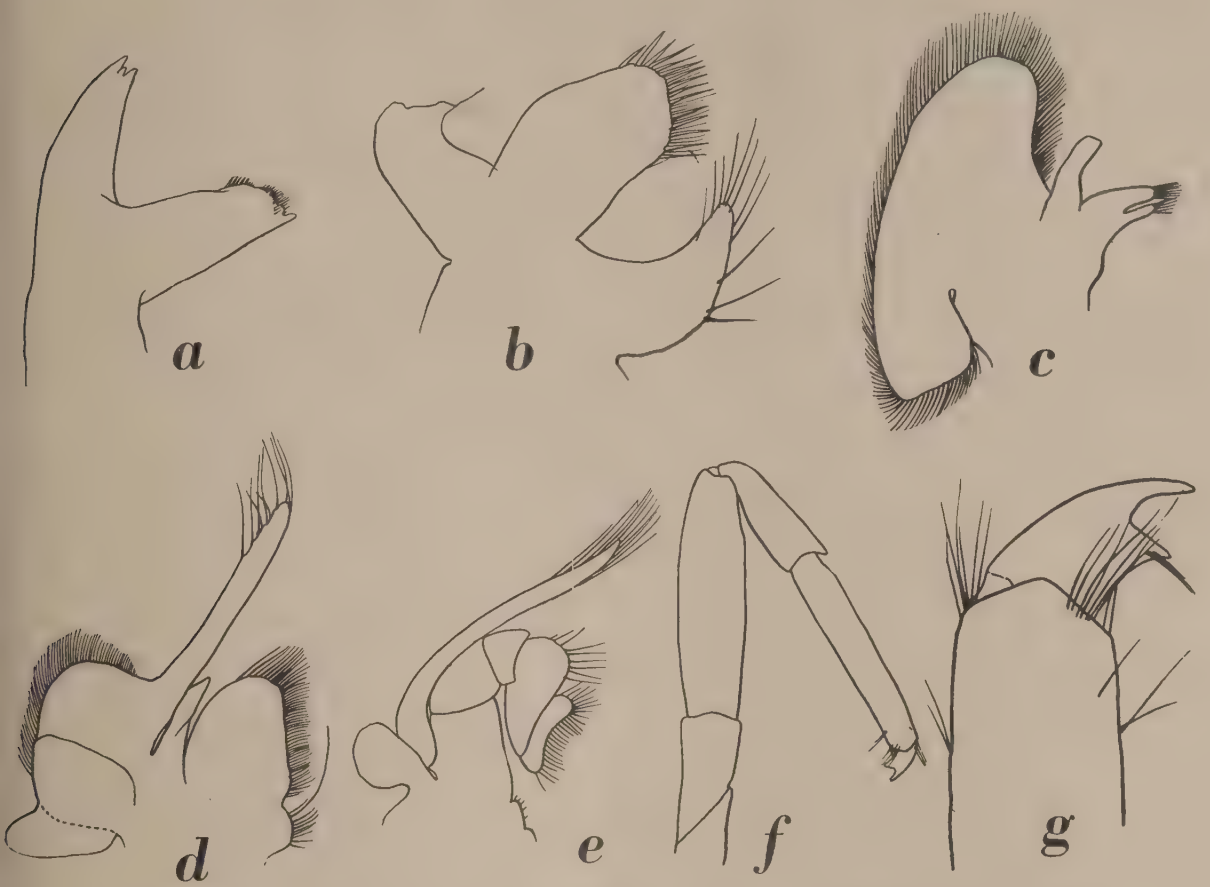


Fig. 37. *Paranchistus biunguiculatus* (Borr.). a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, third pereiopod; g, dactylus third pereiopod. a, b, g, × 68; c-e, × 28; f, × 14.

closely resembles that figured by Borradaile for his specimen; it too shows the distal margin of the last joint strongly concave. The third maxilliped (fig. 36d) fails to reach the end of the antennal peduncle. The penultimate segment is 1½ times as long as the ultimate. The antepenultimate segment is distinctly longer than the penultimate and bears a longitudinal groove on the lower surface. The exopod reaches slightly beyond the end of the antepenultimate segment.

The first pereiopod (fig. 36e) reaches with the chela and part of the carpus beyond the scaphocerite. The fingers are about as long as the palm, the outer margins are convex, the cutting edge is provided with a row of fine pectinations similar to those in various species of *Periclimenes* (e.g. *P. soror, pectiniferus, petitthouarsi, spiniferus, sibogae*). The carpus is 1½ times as long as the

chela, it is broadened anteriorly, becoming narrower posteriorly. The merus is about as long as the carpus. The ischium is very short. The second pereiopods (fig. 36f) are subequal in shape, the left is slightly more slender than the right; they reach with the chela beyond the scaphocerite. The fingers measure about $^2/_3$ of the length of the palm; the dactylus has the apex strongly curved downward, the extreme tip even is slightly curved backwards again. The fixed finger is straight and much shorter than the dactylus. The cutting edge of the dactylus is provided in the proximal half with three broad teeth, that of the fixed finger with many (up to 14) small teeth. The carpus is very short, measuring about $^1/_3$ of the length of the palm; the anterior margin is entire. The carpus bears no spines and is narrower posteriorly than anteriorly. The merus is about twice as long as the carpus, it bears no spines. The ischium is as long as the carpus. The third pereiopod (fig. 37f) reaches to or slightly beyond the end of the scaphocerite. The dactylus (fig. 37g) is short and provided with two strong claws. The propodus is about five times as long as the dactylus and about six times as long as broad. No posterior spines are present on the propodus, except one near the base of the dactylus. The carpus is slightly more than half as long as the propodus. The merus is about as long as the

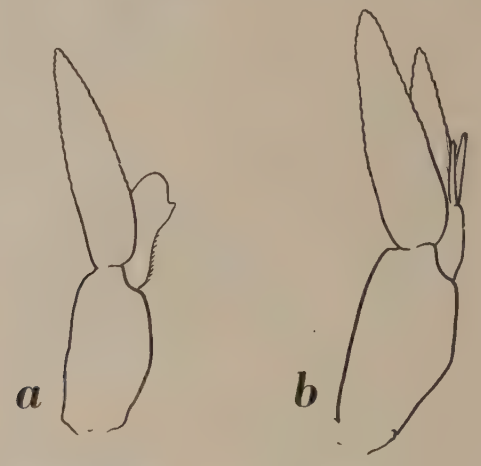


Fig. 38. *Paranchistus biunguiculatus* (Borr.) ♂. a, first pleopod; b, second pleopod. a, b, × 15.

propodus. The ischium is about half as long as the merus. Both pereiopods of the fourth pair are lacking in my specimen. The fifth pereiopod is similarly built as the third, it fails to reach the end of the antennular peduncle.

The first two pleopods of the male are shown in figs. 38a, b.

The uropods reach slightly beyond the end of the telson. The basal segment of the uropods is provided with two dorsal tubercles, one near its base and one near the base of the uropodal endopod; over the base of the exopod it is produced into a long slender process. The exopod has the outer margin straight or slightly convex, provided with setae and ending in a small tooth.

I identify my specimen with Borradaile's *Anchistus biunguiculatus,* as it agrees with Borradaile's description and figure in almost every respect. Borradaile does not mention the hepatic spine, this, however, perhaps is due to the fact that this spine is small and easily overlooked.

The specimens recorded by Nobili (1899) from Batanta and Mefoor (= Noemfoor), 2 ovigerous females from the former and one from the latter locality, still are present in the collection

of the Museo Civico di Storia Naturale in Genoa, Italy, and were there examined by me. These three specimens are about 38 to 45 mm long.

Comparison of Kubo's (1949a) description of his *Anchistus oshimai* with the present species shows them to be identical.

Vertical distribution. The species is a litoral form. Borradaile and Nobili record it to be associated with molluscs of the genus *Tridacna*. Kubo (1949a) reports the species from *Tridacna gigas* (L.).

Horizontal distribution. The species in literature only is recorded from: Batanta, N. New Guinea (Nobili, 1899), Mefoor (= Noemfoor), Geelvink Bay, New Guinea (Nobili, 1899), Tubetube, Engineer Group, Papua (Borradaile, 1899), Helen Atoll, Palau Islands (Kubo, 1949a).

Paranchistus ornatus nov. spec. (figs. 39, 40)

Museum Amsterdam

Mozambique. — 1 ovigerous female 20 mm. (holotype).

The rostrum is more or less compressed, and gradually narrows towards the top; it is swollen at the base and directed downward, the tip reaches almost to the end of the second segment of the antennular peduncle. The tip is truncate, it is provided with one ventral and 4 dorsal teeth, which all are very small and placed close to the apex. Both upper and lower margin are slightly convex. The carapace is smooth and swollen. The lower orbital angle is rounded. The antennal spine is strong and placed some distance below the orbit. The hepatic spine is small, movable and placed slightly behind the antennal spine and on a lower level than it. The anterolateral angle of the carapace is rounded.

The abdomen is smooth. The pleurae of the first five segments are broadly rounded. The sixth segment is slightly longer than the fifth, it is rather broad.

The telson (fig. 39b) is about 1.5 times as long as the sixth abdominal segment and is rather high at the base. The dorsal surface is provided in the posterior half with two pairs of spinules. The posterior pair of these spinules lies slightly nearer to the posterior margin of the telson than to the anterior pair. The posterior margin of the telson bears three pairs of spinules: the outer pair is extremely short, being about $^1/_4$ of the length of the intermediate pair. The submedian pair is more than half as long as the intermediate.

The eyes are well developed, the cornea is shorter and narrower than the eyestalk. The ocellus is distinct.

The first segment of the antennular peduncle is broad. The stylocerite reaches almost to the middle of the segment, it is rather broad and ends in a distinct point. The outer margin of the first antennular segment is straight or slightly convex, it ends in a small anterolateral spine, which is overreached by the convex anterior margin of the segment. The second segment is shorter and broader than the third, its outer part is produced into a lobe, which overreaches the articulation with the third segment. The second and third segments together measure about $^2/_3$ of the length of the first. The upper antennular flagellum has both rami fused for 4 to 6 joints. The free part of the shorter ramus consists of 2 or 3 joints and is slightly longer than half the fused portion.

The scaphocerite reaches distinctly beyond the antennular peduncle. Its outer margin is slightly

convex and ends in a broad tooth. The lamella is broad; the anterior margin is rounded and reaches slightly beyond the final tooth of the scaphocerite. The antennal peduncle bears no spine, its last segment reaches beyond the middle of the scaphocerite.

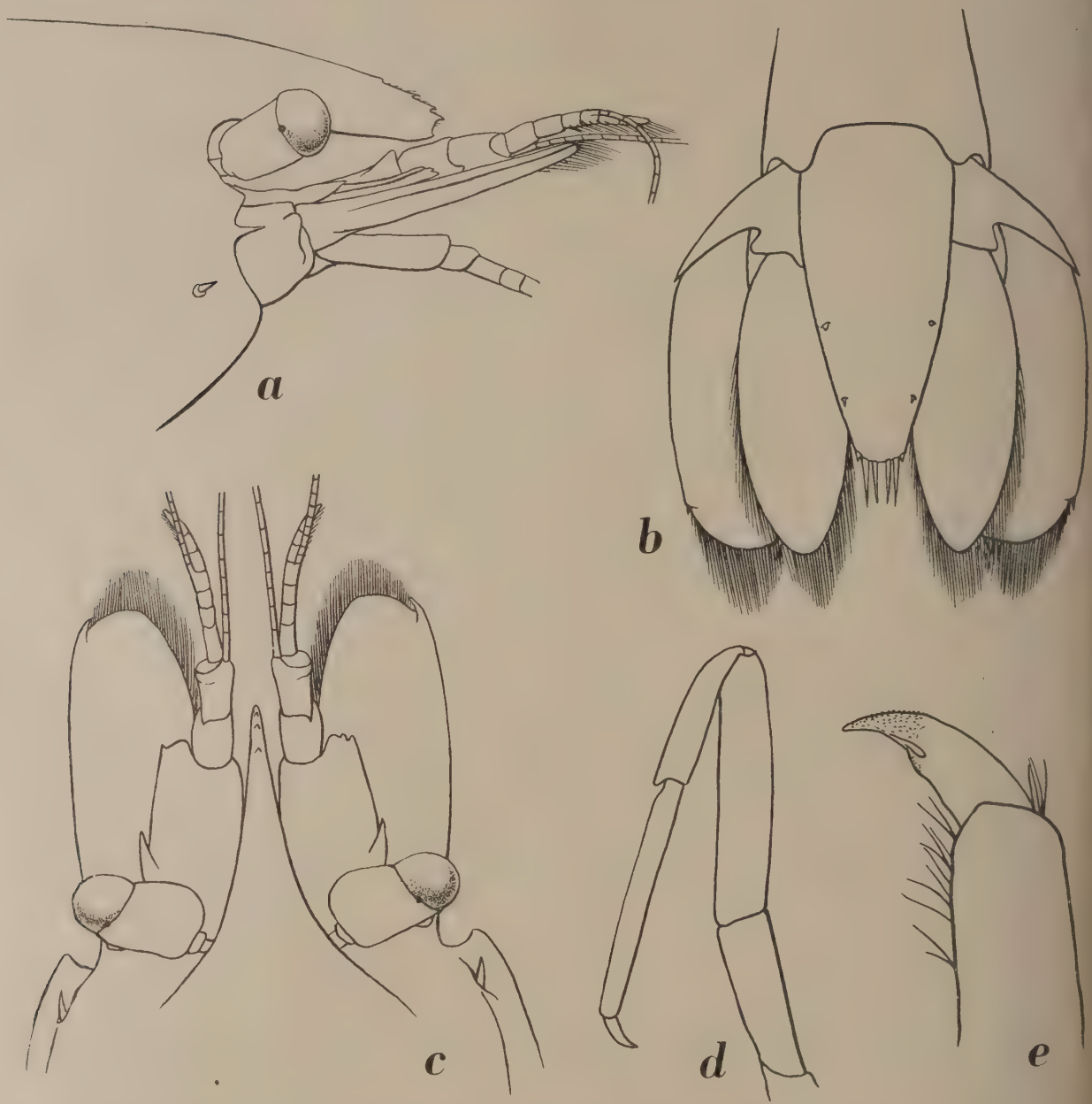


Fig. 39. *Paranchistus ornatus* nov. spec. a, anterior part of body, lateral view; b, telson and uropods, dorsal view; c, anterior part of body, dorsal view; d, third pereiopod; e, dactylus third pereiopod. a-d, × 14; e, × 86.

The mandible is typical in shape. The maxillula (fig. 40a) has the two laciniae broadened, the inner lacinia is distinctly broader than the upper; the upper lobe of the palp is absent. The maxilla (fig. 40b) has the inner lacinia divided into two broad lobes; the palp is rather short. The

first maxilliped (fig. 40c) is typical in shape. The second maxilliped (fig. 40d) differs from that of the preceding species by having the distal margin of the last joint straight or slightly convex. The third maxilliped (fig. 40e) fails to reach the end of the antennal peduncle. The ultimate segment is slightly longer than half the penultimate. The antepenultimate segment is about as long as the ultimate and penultimate combined. The exopod reaches to or slightly beyond the end of the antepenultimate segment. The latter is divided into two parts.

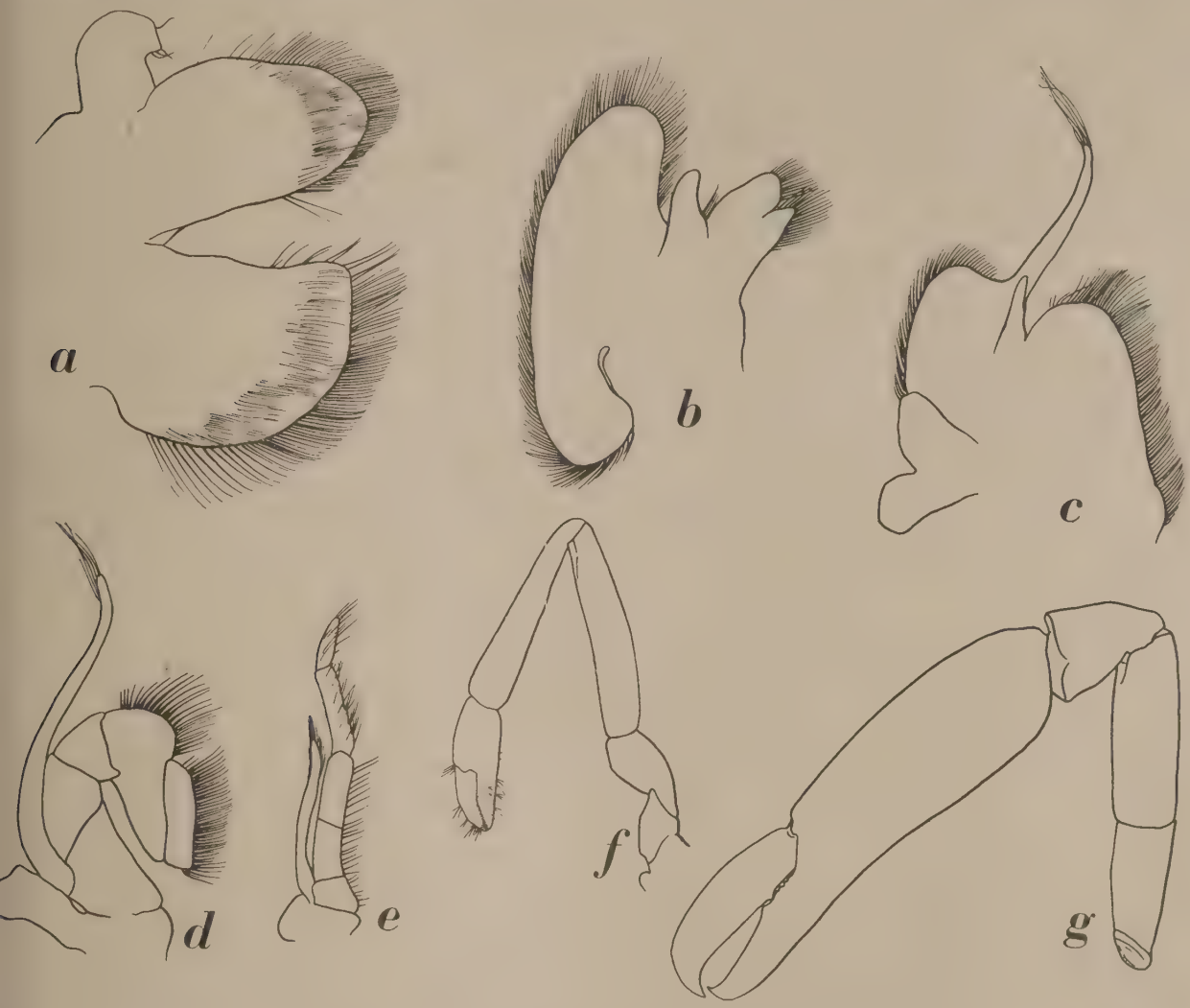


Fig. 40. *Paranchistus ornatus* nov. spec. a, maxillula; b, maxilla; c, first maxilliped; d, second maxilliped; e, third maxilliped; f, first pereiopod; g, second pereiopod. a, × 47; b-d, × 93; e-g, × 11.

The first pereiopod (fig. 40f) reaches with the chela beyond the scaphocerite. The fingers are about as long as the palm and have the cutting edge finely pectinate. The palm is broad. The carpus is 1.5 times as long as the chela, it narrows posteriorly. The merus is as long as the carpus. The ischium is less than half as long as the merus. The second pereiopods (fig. 40g) are strong and equal, they reach with almost the entire chela beyond the scaphocerite. The fingers are of the same length, being about $^{2}/_{3}$ as long as the palm, the tips of the fingers are crossing. The dactylus bears

one strong tooth in the proximal part of the cutting edge, the fixed finger is provided with five or six small teeth, the distal of which mostly is distinctly larger than the rest. The carpus measures about $^1/_3$ of the length of the palm, it has the anterior margin entire and is strongly narrowing posteriorly. The merus is about as long as the fingers and is less than three times as long as broad. The ischium is about $^4/_5$ of the length of the merus. The third pereiopod (fig. 39d) fails to reach the end of the antennal peduncle. The dactylus (fig. 39e) is slender, it measures about $^1/_5$ of the length of the propodus; it is simple, with a small gibbosity in the middle of the posterior margin, the anterior side of the apex bears some very small tubercles; a distinct pit is visible on the lateral surface. The propodus bears no spines at the posterior margin, some hairs are present in the distal part of that margin. The carpus is slightly longer than half the propodus. The merus is about as long as the propodus. The ischium measures $^3/_4$ of the length of the merus. The fourth and fifth pereiopods are similarly built as the third.

The uropods reach beyond the end of the telson. The basal segment of the uropods is produced in a slender spine, which reaches over the basal part of the exopod. The outer margin of the exopod is convex, naked and ends in a small tooth.

The species is most closely related to the next species, *P. nobilii,* from which it differs by having the cutting edges of the first pereiopods pectinate, by the shape of the rostrum and by the shape of the dactylus of the last three pereiopods, moreover the posterior margin of the propodus of the last three legs does not possess any spines in the present species, while in *P. nobilii* some spines are present in the distal part of this posterior margin. The main differences between the present species and *P. biunguiculatus* may be found in the shape of the second pereiopods and in that of the dactylus of the last three pereiopods.

Paranchistus nobilii nov. spec. (figs. 41, 42)

Anchistus Miersi Nobili, 1906, Bull. sci. France Belg., vol. 40, p. 48.
Anchistus Miersi Pérez, 1920, C. R. Soc. Biol. Paris, vol. 83, p. 1027.

Museum Amsterdam

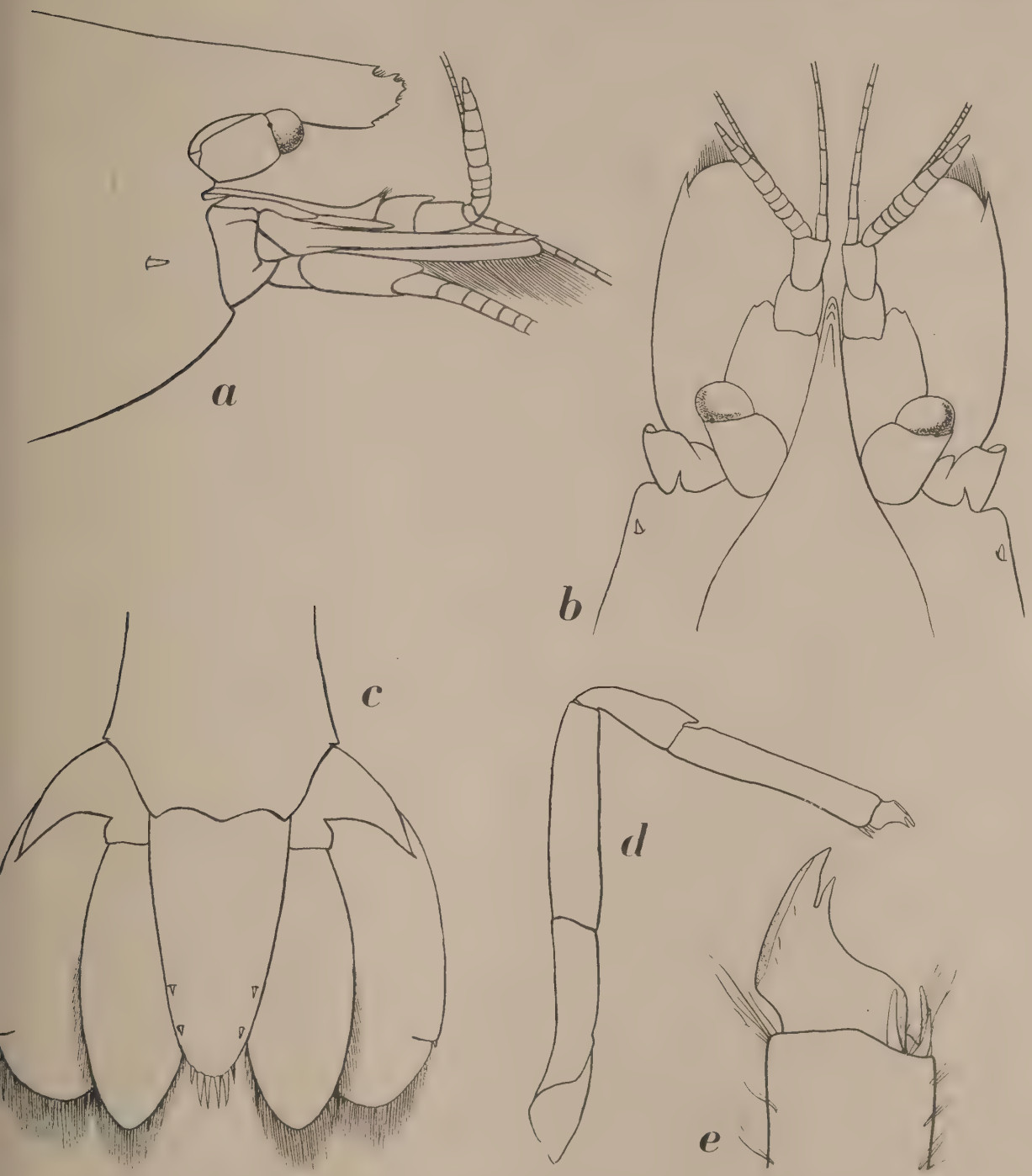
Arzana Island, Rakas Zakoum Bank, Persian Gulf; out of *Spondylus gaederopus* L.; 1901; leg. C. Pérez; coll. J. G. de Man. — 4 specimens (two of which ovigerous females) 16-21 mm.

The rostrum is compressed in the distal part, and is straight or directed slightly downward; it is spatulate in lateral view, being broadest slightly before the tip. The apex of the rostrum reaches almost the end of the second segment of the antennular peduncle, in one of my specimens it reaches slightly beyond that segment. The tip is truncate and provided with some setae, the upper margin bears 3 to 5, the lower margin 2 or 3 teeth, which all are placed close to the apex of the rostrum. The carapace is smooth and slightly swollen, antennal and hepatical spines are present. The antennal spine is rather small and is placed some distance below the rounded lower orbital angle, which is slightly produced anteriorly. The hepatic spine is movable and is placed behind the antennal spine on a much lower level. The anterolateral angle of the carapace is rounded and produced anteriorly.

The abdomen is smooth. The pleurae of the first five segments are broadly rounded. The sixth segment is somewhat longer than the fifth.

The telson (fig. 41c) is about 1.5 times as long as the sixth abdominal segment and is some-

what more than twice as long as broad. The dorsal surface is provided with two pairs of spines, the anterior of which is situated some distance behind the middle of the telson, the posterior pair lies about midway between the anterior pair and the posterior margin of the telson. The posterior margin



ig. 41. *Paranchistus nobilii* nov. spec. a, anterior part of body, lateral view; b, anterior part of body, dorsal view; c, telson and uropods, dorsal view; d, third pereiopod; e, dactylus of third pereiopod. a-d, × 14; e, × 86.

of the telson bears three pairs of spinules. The outer pair is very short, the two inner pairs are subequal in length, though the intermediate spines are stronger than the submedians.

The eyes are well developed. The hemispherical cornea is shorter and narrower than the stalk; a distinct ocellus is present.

The first segment of the antennular peduncle is broad. The stylocerite is strong and ends in a distinct point, it reaches about to the middle of the segment. The anterolateral spine of the first antennular segment is small and distinctly overreached by the convex anterior margin. The second segment is about as long as and distinctly broader than the third. The second and third segments together measure about $^2/_3$ of the length of the first. The upper antennular flagellum has the two rami fused for about 5 joints. The free portion consists of 2 or 3 joints and is about half as long as the fused part.

The scaphocerite is broad, it reaches distinctly beyond the end of the antennular peduncle. The outer margin is convex and ends in a distinct final tooth, which has the tip curved inward. The lamella is ovate and reaches about as far as the tip of the final tooth. The antennal peduncle reaches beyond the middle of the scaphocerite. No spine is present at the base of the antennal peduncle.

The oral parts closely resemble those of *P. ornatus*. The inner lacinia of the maxillula (fig. 42a) perhaps is even slightly more broadened; the upper lobe of the palp of the maxillula is rather distinct. The third maxilliped (fig. 42b) fails to reach the end of the antennal peduncle. The last segment is somewhat more than half as long as the penultimate segment. The antepenultimate segment is about as long as the penultimate and the ultimate together. The exopod reaches distinctly beyond the end of the antepenultimate segment. Like in the previous species, the antepenultimate segment is divided into two parts.

The first pereiopod (fig. 42c) reaches with a large part of the carpus beyond the scaphocerite. The fingers are about as long as the palm and bear many tufts of setae, the cutting edges are not pectinate. The carpus is 1.5 times as long as the chela and about as long as the merus; proximally the carpus is much narrower than distally. The ischium is about half as long as the merus. The second pereiopods (fig. 42d) are subequal, one of them being generally somewhat more slender than the other. The fingers are of about the same length, the dactylus being somewhat longer and more curved than the fixed finger. The cutting edge of the dactylus bears one tooth in the proximal part; the cutting edge of the fixed finger is provided with one tooth slightly behind the middle and 3 to 5 smaller ones proximally of that tooth. The upper margin of the dactylus is provided with many small tufts of short hairs. The palm is slightly more than twice as long as the fingers, it is swollen and cylindrical and is much broader than the carpus. The length of the carpus is about $^1/_4$ of that of the palm. The merus is less than twice as long as the carpus. The ischium is compressed, more or less triangular in shape and about as long as the carpus. The carpus, merus as well as the ischium are unarmed. The third pereiopod (fig. 41d) reaches about to the middle of the scaphocerite. The dactylus (fig. 41e) is short, it is distinctly biunguiculate; the distal part of the anterior surface is broad and flat and is provided with small tubercles. The propodus is about 5 times as long as the dactylus; the posterior margin is provided with some spines near the base of the dactylus. The carpus is about half as long as the propodus. The merus is about as long as, but distinctly broader than the propodus. The length of the ischium is more than half of that of the merus. The fourth and fifth pereiopods are similarly built as the third.

Like in *P. biunguiculatus* the endopod of the first pleopod of the male shows a distinct distally directed tooth at the distal part of the inner margin (fig. 42e). This tooth is more blunt than in *P. biunguiculatus*. The second pleopod of the male closely resembles that of *P. biunguiculatus*.

The uropods are broad and ovate, they reach beyond the end of the telson. The process of the basal segment is slender and pointed. The outer margin of the exopod is convex, naked and ends in a minute movable tooth.

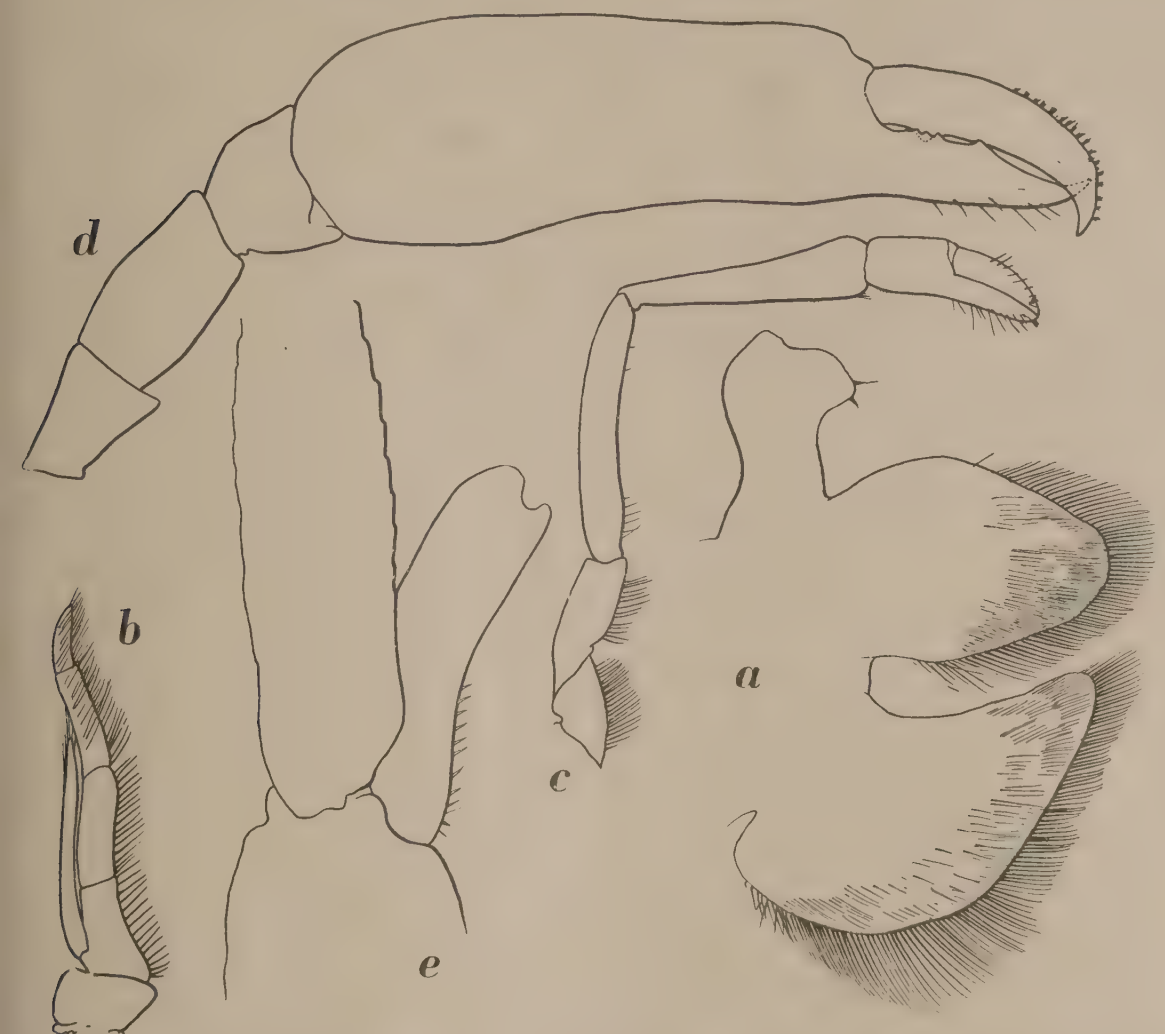


Fig. 42. *Paranchistus nobilii* nov. spec. a, maxillula; b, third maxilliped; c, first pereiopod; d, second pereiopod; e, first pleopod of male. a, × 63; b-d, × 15; e, × 75.

The present species is most closely related to *P. ornatus*; the differences between the two species have already been mentioned in the description of the latter species (p. 100). From *P. biunguiculatus*, the third member of the genus *Paranchistus*, *P. nobilii* differs in the shape of the rostrum and that of the second pereiopods, moreover the cutting edge of the fingers of the first pereiopods in *P. nobilii* are not pectinate as they are in *P. biunguiculatus*. Also the shape of the dactylus of the last three legs in the two species is different.

In a paper on Decapod and Stomatopod Crustacea collected by Bonnier and Pérez in the Persian Gulf, Nobili (1906) referred some prawns to *Anchistus miersi* (De Man). Part of this material was presented to Dr. J. G. de Man, in whose private collection they were preserved. After the death of Dr. de Man his collection was presented to the Zoological Museum at Amsterdam. When studying these specimens I found that they are specifically different from *A. miersi* and that, by the presence of a hepatic spine, they belong in the genus *Paranchistus*. The specimens in my opinion belong to a still undescribed species, which I propose to dedicate to the Italian carcinologist, who for the first time reported upon this material.

The present species is the only Pontoniid species known to live associated with bivalves of the genus *Spondylus*.

Anchistus Borradaile, 1898a

Of the present genus ten species are known. Four of these species have an incertain status, namely *Anchistus armatus* (H. Milne Edwards), *A. maculatus* (Stimpson), *A. spinuliferus* (Miers) and *A. mirabilis* (Pesta). Of *Anchistus armatus*, described by Milne Edwards under the name *Pontonia armata*, too few characters are known to make its identity certain; according to the author the species attains a length of almost 50 mm, which is remarkably large for a species of the present genus. *Anchistus maculatus* was described by Stimpson as *Pontonia maculata* and was obtained from a bivalve of the genus *Tridacna*. Stimpson's remark that the shape of the body is more elongate in his species than in *Conchodytes tridacnae* and that the rostrum is more slender than in that species makes it almost certain that his species belongs in the genus *Anchistus*, which is confirmed by the fact that Stimpson when describing the dactyli of the last three pereiopods does not mention anything about the large basal protuberance. In all probability Stimpson's species is identical either with *A. miersi* or with *A. demani*, which both live in *Tridacna*. With *A. miersi* it agrees in the length of the body (18 mm), in the colourpattern and in the fact that the dactylus of the last three pereiopods is distinctly biunguiculate. Stimpson does not mention the presence of an antennal spine. *Anchistus spinuliferus*, described by Miers as *Harpilius spinuliferus*, is insufficiently known; it may be identical with *A. miersi* or *A. gravieri*. As already pointed out by Kemp (1922) *Anchistus mirabilis*, described as *Marygrande mirabilis* by Pesta, in all probability is based on material consisting of two different species of the present genus.

Kemp (1922) gave a key to four species of the present genus; this key included all species of *Anchistus* known at that time, the species incertae and *A. biunguiculatus*, which now is inserted in the genus *Paranchistus*, excluded. After the publication of Kemp's paper two new species have been described, namely *Anchistus pectinis* Kemp (1925) and *Anchistus misakiensis* Yokoya (1936). These two species are closely related, if they are not identical. The only differences I could find are:

1. Yokoya in his description states that *A. misakiensis* is provided with a pterygostomian spine, a feature not yet known in the present genus.
2. The last three pereiopods in *A. misakiensis* are more slender than in *A. pectinis* and the dactylus is more distinctly biunguiculate.

The first character is not distinctly visible in Yokoya's figure, the anterolateral angle of the carapace is figured more or less pointed, but that also may be due to the fact that the lower margin of the carapace is turned inward; no distinct spine at least is visible. The supposition that

the two species are closely related or identical also is strengthened by the fact that both inhabit Pectinid bivalves. *Anchistus pectinis* namely is recorded from *Pecten* spec., *Anchistus misakiensis* from *Amussium japonicum* (Gmel.). Both species differ from other species of the genus *Anchistus* by the long and curved dactylus of the second pereiopods.

The oral parts of the present genus much resemble those of *Paranchistus*. The mandible has the incisor process ending in three teeth, the molar process bears blunt knobs and ridges and is provided with brushlike arranged spines. The inner lacinia of the maxillula in both species of the present genus examined by me, are broadened, the upper lacinia too is somewhat broadened. The shape of the maxillipeds is normal. The second maxilliped lacks the podobranch; an arthrobranch is present at the base of the third maxilliped.

Anchistus custos (Forsskål) (figs. 43, 44)

Cancer custos Forsskål, 1775, Descript. Anim., pp. xxi, 94.
non *Cancer custos* Forsskål, 1775, Descript. Anim., p. 89.
Palaemon custos Latreille, 1802, Hist. nat. Crust. Ins., vol. 6, p. 337.
non *Pontonia custos* Guérin, 1832, Expéd. sci. Morée, Zool., vol. 2, p. 36, pl. 27 fig. 1 [1]).
Pontonie enflée H. Milne Edwards, 1837, Hist. nat. Crust., vol. 2, p. 360.
Pontonia inflata H. Milne Edwards, 1840, Hist. nat. Crust., vol. 3, p. 633.
Anchistia aurantiaca Dana, 1852, Proc. Acad. nat. Sci. Philad., vol. 6, p. 25.
Anchistia aurantiaca Dana, 1852a, U.S. Explor. Exped., vol. 13, p. 581.
Anchistia aurantiaca Weitenweber, 1854, Lotos Praha, vol. 4, p. 60.
Anchistia aurantiaca Dana, 1855, U.S. Explor. Exped., vol. 13 atlas, p. 12, pl. 38 fig. 2.
Pontonia inflata Tennent, 1861, Sketch. Nat. Hist. Ceylon, p. 479, 486.
Harpilius inermis Miers, 1884, Rep. zool. Coll. Alert, p. 291, pl. 32 fig. B.
Harpilius inermis Müller, 1887, Verh. naturf. Ges. Basel, vol. 7, p. 471.
Pontonia pinnae Ortmann, 1894, Denkschr. med.-naturw. Ges. Jena, vol. 8, p. 16, pl. 1 fig. 3.
Anchistus inermis Borradaile, 1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 387.
Pontonia pinnae Borradaile, 1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 389.
Anchistus inermis Lanchester, 1901, Proc. zool. Soc. Lond., 1901, p. 565.
Anchistus inermis Pearson, 1905, Rep. Ceylon Pearl Oyster Fish., vol. 4, p. 77.
Pontonia pinnae Nobili, 1906, Bull. sci. France Belg., vol. 40, p. 49, pl. 4 fig. 11.
Pontonia pinnae Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 65.
Anchistus inermis Rathbun, 1914, Proc. zool. Soc. Lond., 1914, p. 656.
Periclimenes (Ensiger) aurantiacus Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 376.
Anchistus inermis Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 388.
Pontonia pinnae Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 391.
Anchistus inermis Tattersall, 1921, Journ. Linn. Soc. Zool., vol. 34, p. 391, pl. 27 fig. 4.
Anchistia aurantiaca Kemp, 1922, Rec. Indian Mus., vol. 24, p. 138.
Anchistus inermis Kemp, 1922, Rec. Indian Mus., vol. 24, p. 249, fig. 81.
Anchistus inermis Hedley, 1924, Rec. Aust. Mus., vol. 14, p. 146.
Anchistus inermis Kemp, 1925, Rec. Indian Mus., vol. 27, p. 322.
Anchistus inermis Barnard, 1926, Trans. Roy. Soc. S. Afr., vol. 13, p. 121.
Anchistus inermis Gravely, 1927, Bull. Madras Govt. Mus., n. ser. vol. 1, p. 137, pl. 19 fig. 5.
Anchistus inermis Hale, 1927, Crust. S. Aust., vol. 1, p. 57, fig. 52.
Anchistus inermis Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 48, figs. 15-17.
Anchistus inermis Barnard, 1950, Ann. S. Afr. Mus., vol. 38, p. 792, fig. 150 a-d.

1) In this list no further references are given of authors, who following Guérin (1832) used the trivial name *custos* for the Mediterranean *Pontonia pinnophylax* (Otto).

Siboga Expedition

Station 125, anchorage off Sawan, Siau Island, Sangihe Group; reef; depth 27 m; July 18 and 19, 1899. — 1 specimen 24 mm.

Station 258, Tual anchorage, Kai Islands; reef exploration and dredge; depth 22 m; bottom lithothamnion, coral and sand; December 12-16, 1899. — 2 specimens (one ovigerous female) 27 and 28 mm.

Snellius Expedition

Kera near Timor; November 11-13, 1929. — 1 ovigerous female 32 mm.

Museum Leiden

Takao, South Formosa; out of *Pinna* spec.; September 15, 1907; leg. H. Sauter. — 1 ovigerous female 32 mm.

Locality unknown; out of *Pinna* spec.; leg. M. J. Landauer. — 1 specimen 24 mm.

Museum Amsterdam

Bay of Djakarta (= Batavia); leg. C. P. Sluiter. — 1 specimen 21 mm.

Lesser Sunda Islands; December 18, 1909; leg. H. J. M. Laurense. — 3 specimens 22-30 mm.

The present specimens agree with K e m p's description. The antepenultimate segment of the third maxilliped not always is as broad as figured by K e m p and the lateral margins of the chela of the first pereiopod in some specimens are not so strongly curved inward as in others, though this character always is present.

The oral parts all are figured here (figs. 43a-e).

The endopod of the first pleopod of the male shows a laterally directed triangular process in the distal part of the inner margin. This process, however, is not equally distinct in the specimens at my disposal (figs. 44a, b). The second pleopod resembles that of the specimens of the preceding genus.

The trivial name *inermis* cannot be used for the present species as it is preoccupied by three other names, the oldest being F o r s s k å l's name *custos*. F o r s s k å l's *Cancer custos* was collected in the Red Sea and was living in a species of *Pinna*. The only four genera of Pontoniinae known to be associated with Lamellibranchs are *Pontonia, Conchodytes, Paranchistus* and *Anchistus*. The genera *Pontonia* and *Paranchistus* may be excluded here as no Indo-Westpacific species of these ever have been found in a species of *Pinna*, while moreover the species of *Pontonia* never attain the length of 37 mm mentioned by F o r s s k å l for his species. F o r s s k å l in his description states the rostrum of *Cancer custos* to be elongate, conical and measuring one third of the length of the carapace. In *Conchodytes* the rostrum is broadly triangular and depressed, it is distinctly shorter than one third of the carapace. In *Anchistus*, however, the rostrum indeed is elongate, conical at base and compressed in the anterior part and easily attains one third of the length of the carapace. The only genus therefore in which F o r s s k å l's species may belong is *Anchistus*. According to F o r s s k å l's description the rostrum is unarmed, a feature in the genus *Anchistus* only shown by *Anchistus inermis*. We therefore may safely identify *Cancer custos* with *Anchistus inermis* the more as all other characters mentioned by F o r s s k å l for his species may be found in *Anchistus inermis*. This species namely may attain a

size of 39 mm (vid. Kemp, 1922), its body is smooth and the colour mentioned by Forsskål "flavicans, albopunctatus" also is found in *Anchistus inermis* according to Kemp's (1922) remark

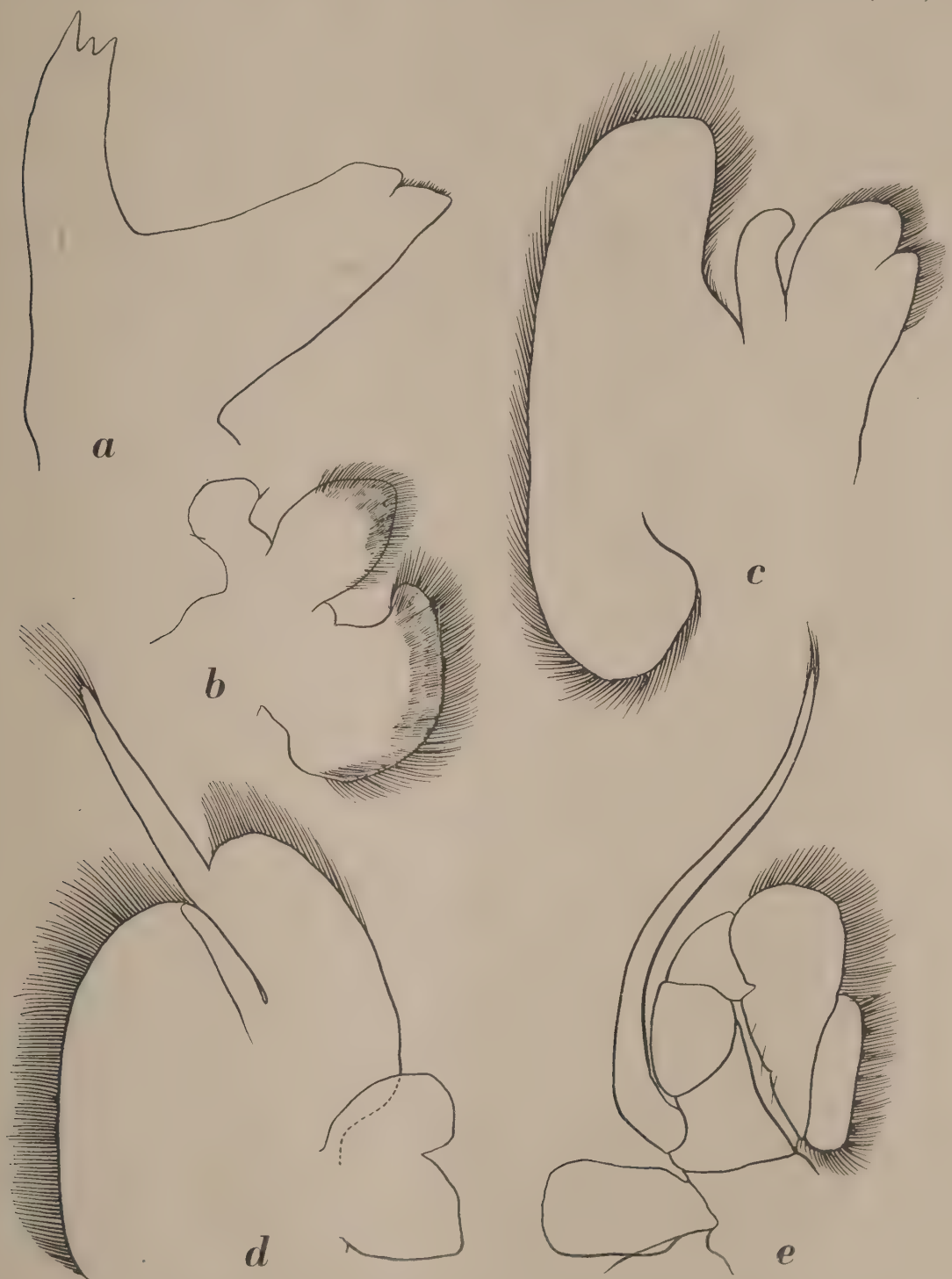


Fig. 43 *Anchistus custos* (Forsskål). a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped. a, × 75; b-e, × 31.

"Living specimens vary in colour from pale straw to bright orange yellow. In females the entire body and legs are covered with minute white dots", this colour, however, also may be observed in *Conchodytes biunguiculatus*. The other characters, mentioned by Forsskål, too are present in *Anchistus inermis*, the most important being that of the shape of the rostrum, the cylindrical and slender chelae and the shape of the fingers; in my material often the dactylus of the second legs is slightly longer than the fixed finger, and also often the second pereiopods are equal in shape, though they frequently are unequal as is stated by Kemp (1922) for his specimens. With *Conchodytes biunbuiculatus*, *Anchistus inermis* is the most common inhabitant of bivalves of the genus *Pinna*, though *Anchistus miersi* also is recorded to live sometimes in association with these bivalves. *Anchistus inermis* is known from the Red Sea, so that the identity of *Cancer custos* with *Anchistus inermis* may be accepted without any doubt. The species must be named therefore *Anchistus custos* (Forsskål). Nobili (1906) already pointed to the probable identity of *Cancer custos* with the present species, named by

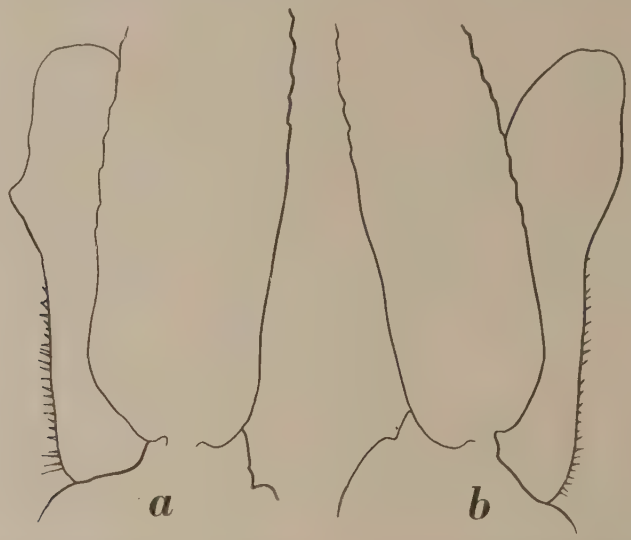


Fig. 44. *Anchistus custos* (Forsskål) ♂. a, b, endopod of first pleopod, showing different shapes. a, b, × 50.

him *Pontonia pinnae*. This author, however, thought that Forsskål's name *custos* may not be used for the present species as it is preoccupied by the name *Cancer custos* used by Forsskål (probably by mistake) for a Pinnotherid species, which is printed some pages before the name for the shrimp. Nobili is mistaken here, as the name *Cancer custos* is used for the first time in Forsskål's work on p. xxi in the review of the species, which is printed at the beginning of the work, and this name, as is clear from the indications accompanying it, is intended for the Macruran, the name for the crab being not mentioned in the review. Therefore the name *custos* for the Macruran preoccupies that for the Brachyuran. Guérin (1832) identified Forsskål's species with the Mediterranean species at present known as *Pontonia pinnophylax* (Otto), his error is corrected by later authors, though one still often will find Forsskål's name used for *Pontonia pinnophylax*.

The present species has been described for the second time as new by H. Milne Edwards (1837) under the name Pontonie enflée. The following characters given by Milne Edwards for his species make the identity pretty certain:

1. The compressed rostrum, which is directed downward and almost reaches the end of the

scaphocerite. As Milne Edwards mentions nothing about the dentition of the rostrum, it in all probability is unarmed.
2. The absence of the antennal spine.
3. The swollen carapace.
4. The large and cylindrical chelae of the second pereiopods.
5. The length of 25 mm.

Milne Edwards does not give a latin name to this species in the second volume of his Histoire naturelle des Crustacés, probably it is omitted by accident. In the index to the species, genera, families etc. given at the end of the third volume of his work Milne Edwards (1840) mentions the name *Pontonia inflata* and refers to the page containing the description of his Pontonie enflée; there can be little doubt that his *Pontonia inflata* is the same as his Pontonie enflée.

Kemp (1922) considered Dana's *Anchistia aurantiaca,* which was placed by Borradaile (1917a) in a separate subgenus *Ensiger* of the genus *Periclimenes,* as a species incerta. In this respect I do not agree with Kemp, as in my opinion *Anchistia aurantiaca* shows all characters of *Anchistus custos,* which is distinctly shown by Dana's figure; Dana's statement "Pedes antici superficie manus internâ prope basin densè laxèque pubescentes" in all probability refers to the peculiar shape and pubescence of the chela of the first pereiopods characteristic for *Anchistus custos.* The fact that Dana observed only two spines on the posterior margin of the telson probably is due to the small size of the spines; he perhaps took the others to be hairs. The orange colour of the species also is in accordance with Kemp's above cited statement on the colour of *Anchistus inermis.*

Vertical distribution. The species is a litoral form. It is recorded in literature to live in association with: *Pinna* spec. (Miers, 1884; Ortmann, 1894; Nobili, 1906, 1906b; Rathbun, 1914; Kemp, 1922; Gravely, 1927; Barnard, 1950), "Black Pinna" (Tattersall, 1921), *Pinna bicolor* Chemn. (Kemp, 1922), *Pinna dolabrata* Lam. (= *P. inermis* Tate) (Hale, 1927), *Pinna madida* Reeve (Hedley, 1924), *Pinna nigra* Chemn. (Forsskål, 1775; Kemp, 1925), *Pinna nigra* Chemn. (as *P. nigrina* Lam.) (Kemp, 1922), *Pinna saccata* L. (Forsskål, 1775), *Pinna vexillum* Born. (Kemp, 1922). Furthermore it is recorded by Lanchester from the "infra branchial chamber of a large Gastropod".

Horizontal distribution. The species is recorded in literature from: Red Sea (Nobili, 1906b), Suakin Harbour, Red Sea (Tattersall, 1921), Loheia, Red Sea (Forsskål, 1775), Jibuti (Nobili, 1906b), Dar es Salaam, Tanganyika (Ortmann, 1894), Delagoa Bay, Portuguese East Africa (Barnard, 1926, 1950), N.E. of Arzana Island, Persian Gulf (Nobili, 1906; Kemp, 1922), Gulf of Manaar (Pearson, 1905), Pamban, Gulf of Manaar (Kemp, 1922), Kutikal, Krusadai Island, Gulf of Manaar (Gravely, 1927), Ceylon (H. Milne Edwards, 1837; Tennent, 1861), Cheval Paar, Ceylon (Pearson, 1905; Kemp, 1922), Trincomali, Ceylon (Müller, 1887), Andaman Islands (Kemp, 1922), Port Blair, Andaman Islands (Kemp, 1922), Octavia Bay, Nancowry Harbour, Nicobar Islands (Kemp, 1925), Paway Island, Mergui Archipelago (Kemp, 1922), Pulau Bidan, Penang (Lanchester, 1901), Palau (Kubo, 1940), Hermite, Monte Bello Islands, West Australia (Rathbun, 1914), Sharks Bay, West Australia (Miers, 1884), St. Vincent Gulf, S. Australia (Hale, 1927), Port Molle, Queensland (Miers, 1884), Bowen, Queensland (Hedley, 1924), Vanikoro, Santa Cruz Islands (H. Milne Edwards, 1837; Kemp, 1922), Fiji Archipelago (Dana, 1852). The species now for the first time is recorded from the Malay Archipelago.

Anchistus miersi (De Man) (fig. 45)

Harpilius Miersi De Man, 1888a, Journ. Linn. Soc. Lond. Zool., vol. 22, p. 274, pl. 17 figs. 6-10.
Harpilius miersi Whitelegge, 1897, Mem. Aust. Mus., vol. 3, p. 148.
Anchistus miersi Borradaile, 1898, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 387.
Anchistus miersi Anonymus, 1899, Mem. Aust. Mus., vol. 3, p. 518.
Coralliocaris nudirostris Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 235.
Anchistus miersi Borradaile, 1899, Willey's Zool. Res., vol. 4, p. 408.
non *Anchistus Miersi* Nobili, 1906, Bull. sci. France Belg., vol. 40, p. 48.
Anchistus Miersi Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 63.
Anchistus Miersi Nobili, 1907, Mem. Accad. Sci. Torino, ser. 2 vol. 57, p. 359.
Anchistus miersi Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, pp. 324, 388, pl. 56 fig. 25.
non *Anchistus Miersi* Pérez, 1920, C. R. Soc. Biol. Paris, vol. 83, p. 1027.
Anchistus miersi Tattersall, 1921, Journ. Linn. Soc. Lond. Zool., vol. 34, p. 391.
Anchistus miersi Kemp, 1922, Rec. Indian Mus., vol. 24, p. 255, fig. 85.
Anchistus miersi Ramadan, 1936, Bull. Fac. Sci. Egypt. Univ., vol. 6, p. 23.
Anchistus miersi Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 51, figs. 18-20.

Siboga Expedition

Station 78, Lumulumu Shoal, Borneo Bank; in *Tridacna* spec.; shore exploration; depth 34 m; bottom coral and coralsand; June 10 and 11, 1899. — 1 specimen 25 mm.

The specimen agrees well with De Man's description. The chelae of the second legs have the dactylus provided with one large ventral tooth, the fixed finger bears some small denticles in the proximal part of the cutting edge. The telson (fig.45) differs from the description given by Kemp (1922) in having the outer pair of spinules of the posterior margin placed some distance before the intermediate and submedian pairs, resembling in this feature *Conchodytes nipponensis* (De Haan), in which species, however, the character is much more distinct. The scaphocerite of my specimen shows the same shape as in Kemp's specimen of *Anchistus demani.*

The oral parts of the present species show no essential differences from those of *Anchistus custos.* In Borradaile's (1917a) paper most of the oral parts of *A. miersi* are figured.

The specimens described by Nobili (1906) as belonging to the present species could be examined by me and proved to belong to a new species, described here (p. 100) as *Paranchistus nobilii*; the same specimens are mentioned by Pérez (1920).

The specimen, an ovigerous female of 19 mm, from Mefoor (= Noemfoor), N.W. New Guinea, which Nobili (1899) identified as *Coralliocaris nudirostris* (Heller), was examined by me in the Museo Civico di Storia Naturale in Genoa, Italy, and proved to belong to *Anchistus miersi* (De Man).

Vertical distribution. The species is a litoral form and is found to live in association with: a mollusc (Nobili, 1899), *Tridacna squamosa* Lam. (Borradaile, 1899), *Tridacna* spec. (Kemp, 1922; present publication), *Pteria* (= *Meleagrina*) spec. (Nobili, 1907), and *Pinna* spec. (Nobili, 1906b; Tattersall, 1921).

Horizontal distribution. Records in literature are: Red Sea (Nobili, 1906b), Ghardaqa, Red Sea (Ramadan, 1936), Suakin Harbour, Red Sea (Tattersall, 1921), Egmont Reef, Seychelles (Borradaile, 1917a), Hulule, Male Atoll, Maldive Archipelago (Borradaile

1917a), Port Blair, Andaman Islands (Kemp, 1922), Elphinstone Island, Mergui Archipelago (De Man, 1888a; Kemp, 1922), Pulu Condore, Indo China (Kemp, 1922), Palau (Kubo, 1940), Djakarta (= Batavia) (Kemp, 1922), Mefoor (= Noemfoor), Geelvinck Bay, N.W. New

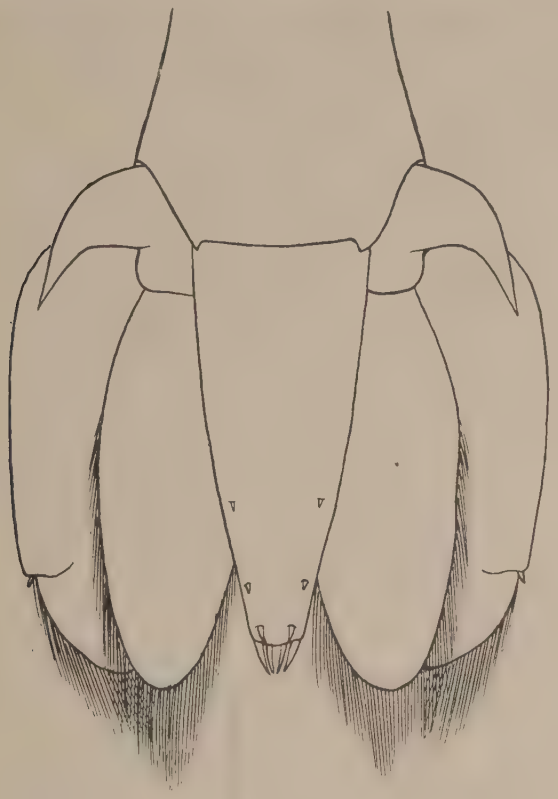


Fig. 45. *Anchistus miersi* (De Man). telson and uropods, dorsal view. × 16.

Guinea (Nobili, 1899), Dobu, d'Entrecastaux Group, Papua (Borradaile, 1899), Funafuti, Ellice Islands (Whitelegge, 1897; Anonymus, 1899), Mangareva-Tearia, Gambier Archipelago (Nobili, 1907).

Thaumastocaris Kemp, 1922

The only species known of the present genus, *Thaumastocaris streptopus,* is represented by rather abundant material in the present collections.

Thaumastocaris streptopus Kemp, 1922 (figs. 46, 47)

Thaumastocaris streptopus Kemp, 1922, Rec. Indian Mus., vol. 24, p. 244, figs. 78-80.

Siboga Expedition

Station 258, Tual anchorage, Kai Islands; reef exploration and dredge; depth 22 m; bottom Lithothamnion, sand and coral; December 12-16, 1899. — 1 specimen 26 mm.

Station 282, anchorage between Nusa Besi and the N.E. point of Timor, 8° 25′.2 S, 127° 18′.4 E; trawl, dredge and reef exploration; depth 27-54 m; bottom sand, coral and Lithothamnion; January 15-17, 1900. — 4 specimens (one of which is an ovigerous female) 18-36 mm.

Snellius Expedition

Amboina; September 11-17, 1930. — 4 specimens 11-14 mm.

In my specimens the rostrum is provided with 9 to 11 dorsal and with 3 ventral teeth. The lateral carina of the rostrum does not continue in the orbital margin, but forms a postorbital ridge,

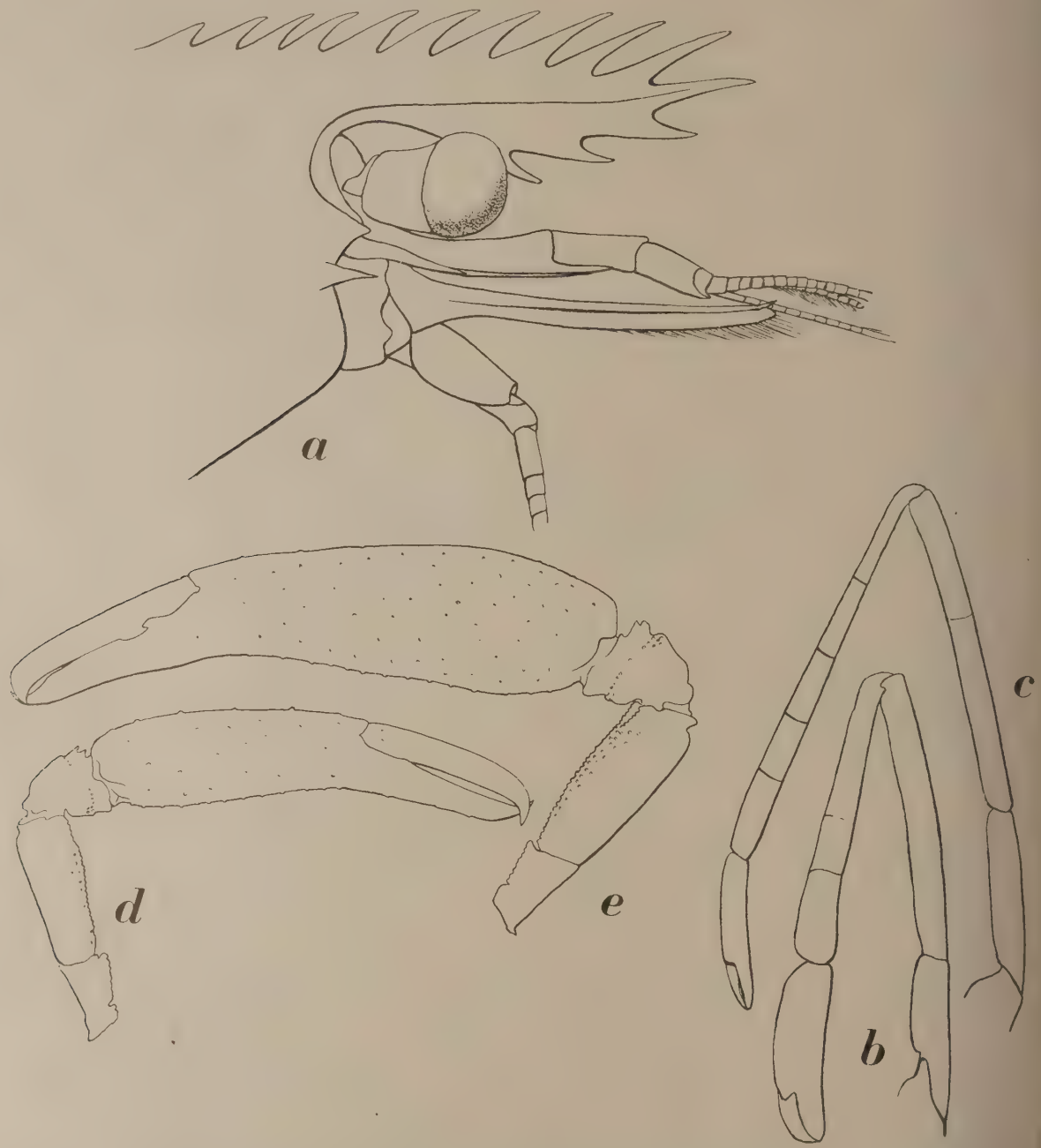


Fig. 46. *Thaumastocaris streptopus* Kemp. a, anterior part of body, lateral view; b, shorter first pereiopod; c, longer first pereiopod; d, smaller second pereiopod; e, larger second pereiopod. a, × 17; b, c, × 12; d, e, × 6.

which ends below the lower orbital angle in a blunt tooth of the anterior margin of the carapace (fig. 46a).

The oral parts resemble those of the species of *Periclimenes*. The mandible (fig. 47a) lacks the palp, the incisor process ends in two teeth, the molar process bears blunt teeth and some spines.

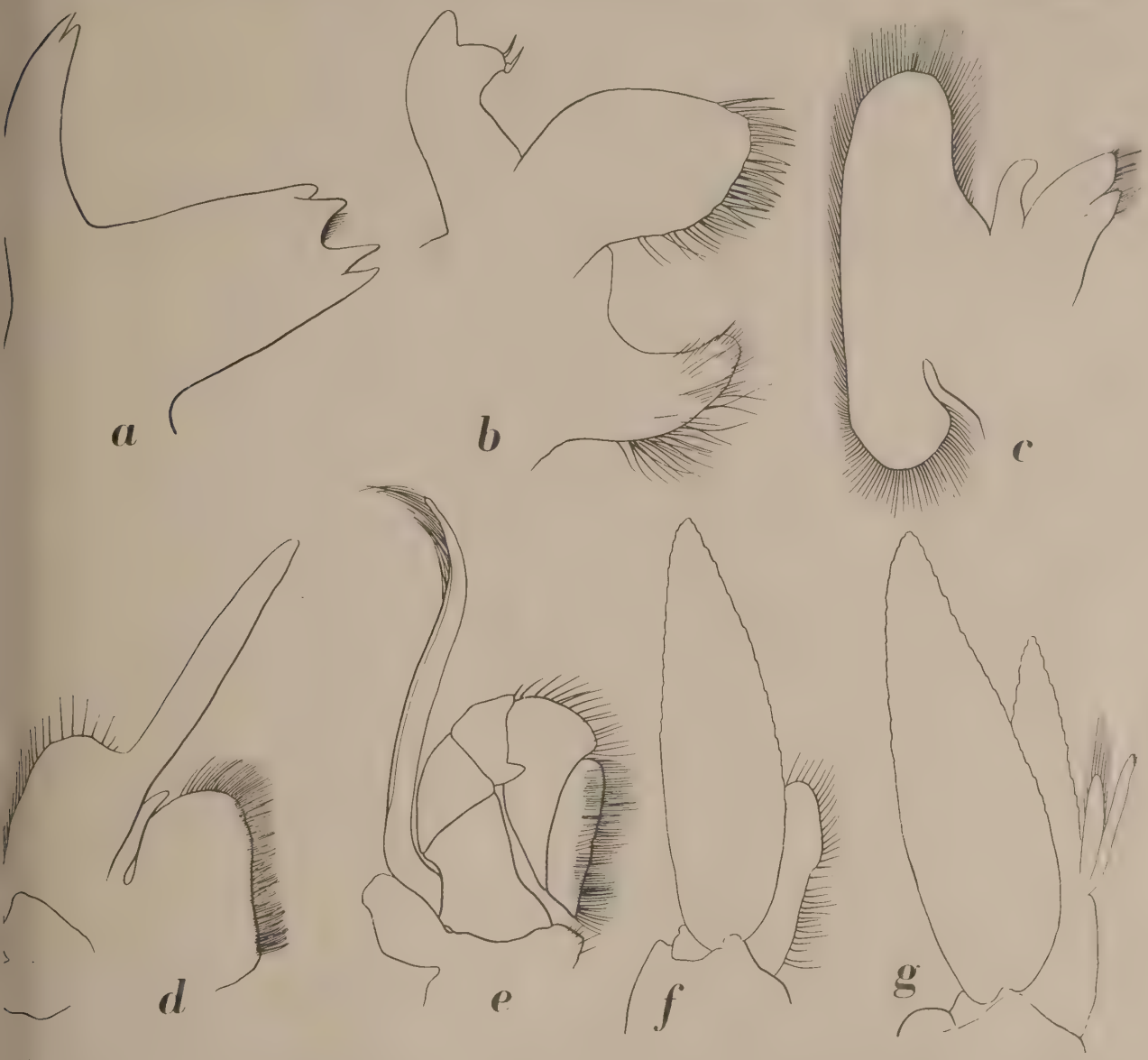


Fig 47. *Thaumastocaris streptopus* Kemp. a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, first pleopod of male; g, second pleopod of male. a, b, × 47; c-g, × 23.

The maxillula (fig. 47b) has the inner lacinia slender, the upper lacinia is slightly broadened and the palp is distinctly bilobed, the lower lobe ending in two sharp points. The maxilla (fig. 47c) has the inner lacinia cleft, the palp is well developed, the scaphognathite is large, but not very broad. The maxillipeds (figs. 47d, e) are quite normal in shape, all are provided with exopods. No podobranch is present at the second maxilliped; the third maxilliped is provided with an arthrobranch.

The first pereiopods (figs. 46b, c) in my specimens always are unequal, one of them is longer and slenderer than the other. The chela in the longer leg has the fingers about 1/3 of the length of the palm, in the other leg they are relatively longer, but in none of my specimens the fingers exceed half the length of the palm; they mostly are more clumsy than figured by K e m p.

The two largest specimens from Siboga Station 282 are an adult male and an ovigerous female. In both specimens the second pereiopods (figs. 46d, e) are present. These pereiopods are slightly unequal, the right being somewhat larger than the left. The larger second leg in my specimens agrees with K e m p's description of the only second leg present in his specimen. The only differences I could find are: in my specimens all limbs are more strongly tuberculated and the anterior margin of the carpus bears two distinct teeth between the excavation at the inner side and the crenulation at the upper margin. The fingers generally are longer, being about as long as or slightly longer than half the palma. The left leg is slightly shorter and more slender than the right. The fingers are somewhat shorter than the palm. The shape of the other joints of this leg is similar to that of the right leg.

The first two pleopods of the male are figured here (figs. 47f, g); they do not show essential differences from those of the species of the subgenus *Harpilius* of the genus *Periclimenes*.

In all other respects my specimens closely agree with K e m p's excellent description and figures.

Distribution. The only previous record of this species is that by K e m p (1922) from Noumea, New Caledonia.

Periclimenaeus Borradaile, 1915

Definition: Pontoniid prawns living in association with Porifera, Gorgonaria and Ascidia. Body clumsy, compressed, rather high. Rostrum distinct, with teeth. Carapace smooth, with antennal and sometimes with supraorbital spines. Hepatic spines always absent; sometimes a postorbital ridge is present.

Abdomen smooth, straight, not geniculate and as high as the thorax. Pleurae of the first four segments broadly rounded. Sixth segment slightly if at all longer than the fifth.

Telson rather broad, upper surface with two pairs of spinules; posterior margin with three pairs of spinules.

Eyes distinct with hemispherical cornea.

Basal segment of antennular peduncle broad, outer margin before the stylocerite generally produced into a triangular process. Stylocerite mostly short, broad, directed obliquely outward, sometimes slender. Last two segments of antennular peduncle short. Upper antennular flagellum with two rami, free portion of the shorter ramus sometimes very short.

Mandible without palp; molar process with or without spines, mostly with blunt knobs; incisor process variable in shape, sometimes very short (*P. pearsei, P. bermudensis*), often ending into 2-5 (mostly 2) teeth (*P. truncatus, minutus, atlanticus, tridentatus*); in some species (*P. rhodope, arthrodactylus*) the distal margin of the cutting edge is crenulate. Maxillula with the inner lacinia narrow, tapering towards the tip, upper lacinia rather broad, and provided with spines at the distal margin, palp of maxillula bilobed or entire. Maxilla provided with a large though not very broad scaphognathite; as in the previous genera the palp is distinct; the inner lacinia is simple (*P. robustus*.

maxillulidens, pearsei, atlanticus, tridentatus) or distinctly bilobed (*P. truncatus, rhodope, arthrodactylus, minutus*). The first maxilliped has the basis and coxa sometimes distinctly separated, sometimes the notch between basis and coxa is indistinct or even absent; palp well developed, exopod with a caridean lobe of varying breadth, epipod rather small. Second maxilliped of the same shape as in *Periclimenes,* podobranch absent. Third maxilliped slender, provided with a small arthrobranch. All maxillipeds with exopods.

First pereiopods slender, reaching beyond scaphocerite. Second pereiopods strongly unequal, the larger leg very strong, resembling the large cheliped in *Alpheus*; palm cylindrical, swollen; fingers short and blunt, provided with 1 to 3 teeth, one of which is truncate, hammershaped and fits in a pit of the other finger; the other second leg is shorter and more slender, it is differently built. Third to fifth pereiopods slender. Shape of the dactylus of these legs very variable, sometimes uni-, sometimes biunguiculate, often provided with many accessory denticles along the posterior margin, sometimes with a movable tip. Basal part of posterior margin of dactylus, though sometimes more or less broadened never transformed into a distinct process as in *Coralliocaris, Conchodytes* or one of the allied genera: when the dactylus is curved backward this broadened part disappears in a slit of the propodus.

Uropods ovate in shape, rather broad. Outer margin of exopod ending into two or more spines.

Type: *Periclimenaeus robustus* Borradaile (1915).

In literature various species of the genus *Periclimenaeus* have been placed in a number of quite different genera. The cause of this may be found in the fact that the present genus shows some characters, which at first sight seem to be intermediate between characters, which in the present subfamily are thought to be of generic value; furthermore characters, which in other genera prove to be very constant are variable in the present genus. So for instance: the basal part of the dactylus of the last three pereiopods in some members of *Periclimenaeus* is more or less broadened, in others this broadening is entirely absent. As the character of the presence or absence of one or more basal tubercles at the base of the dactylus of these pereiopods is of the first importance for the separation of the genera of Pontoniinae, it is not surprising to find part of the species now inserted in *Periclimenaeus,* in literature referred to the genus *Periclimenes* (which has the dactyli without basal protuberance) and part to the genus *Coralliocaris* (in which this basal tubercle is very distinct). When, however, we compare species of *Periclimenaeus,* in which this basal part of the dactylus is swollen, with species belonging to genera as *Coralliocaris* and *Conchodytes,* it becomes evident that they do not belong in the same section of the Pontoniinae. The basal widening in *Periclimenaeus* namely, though sometimes distinct, never is developed to such a degree as in the genera of the section containing *Coralliocaris* and *Conchodytes*: the broadened part of the dactylus is concealed in a slit of the posterior margin of the propodus when the dactylus is curved backward, which certainly is not the case in genera as *Coralliocaris* and *Conchodytes.* Also the proximal ventral angle of the dactylus of some species of *Periclimenaeus* may be taken for a basal tubercle: when namely the dactylus is curved far forward, this angle becomes visible as a more or less distinct process, it is, however, again concealed by the slit of the propodus, when the dactylus takes its normal position.

The variability of the shape of the dactylus of the last three pereiopods in the present genus is remarkable; not only in the presence or absence of a basal widening, but also by being uni- or biunguiculate or even entirely aberrant. Many species have distinctly biunguiculate dactyli, while

others have the dactyli simple. *P. tridentatus*, however, shows all transitions between a simple and a biunguiculate claw. *P. arthrodactylus* has the dactylus entirely aberrant, here namely the tip has the shape of a saw and is movably connected with the rest of the dactylus which possesses no teeth.

Twenty five species described in literature now are placed in the present genus, some of them, however, are synonyms. The large confusion in regard to the systematic place of those species is best illustrated by the fact that 9 of them have been placed in the genus *Coralliocaris* (one of which in the subgenus *Onycocaris*), 10 have been placed in the genus *Periclimenes* (five in the subgenus *Periclimenaeus*, one in the subgenus *Ancylocaris*, and one in the subgenus *Hamiger*), one in the genus *Typton*, 14 in the genus *Periclimenaeus* and one even in the genus *Palaemonetes*. In the present paper three new species are described. This brings the total number of representatives of the present genus, known at present, at 25 species. Of these 25 species 9 inhabit the West Indies, 3 the Pacific coast of America, while the other species are Indo-Westpacific forms. Six species are known at present from the Malay Archipelago, none of them being recorded before from that region.

Key to the Indo-Westpacific species of *Periclimenaeus*

1. Supraorbital spines present 2
— Supraorbital spines absent 7
2. Supraorbital spine very large, reaching beyond the base of the cornea. Outer margin of uropodal exopod with many denticles in the distal part . . . . *truncatus*
— Supraorbital spine small, not reaching the base of the eye. Only two spines at the end of the outer margin of the uropodal exopod 3
3. Fingers of first pereiopod as long as or longer than palm . . . . . *tridentatus*
— Fingers of first pereiopod less than $^2/_3$ as long as palm 4
4. Dactylus of last three pereiopods about $^1/_3$ as long as propodus or shorter, biunguiculate, posterior margin of tip not dentate 5
— Dactylus of last three pereiopods about half as long as propodus, very slender, with movable tip, which has the posterior margin dentate . . . . . *arthrodactylus*
5. Dactylus of last three legs distinctly biunguiculate. Propodus of all three walking legs with posterior spines, carpus of all these legs without such posterior spines. One or two teeth of the rostrum placed behind the posterior orbital margin . . . . . *rhodope*
— Dactylus of last three legs very indistinctly biunguiculate. Propodus and carpus of third and fourth leg with, those of fifth leg without posterior spines. All teeth of the rostrum placed before the posterior limit of the orbit 6
6. Rostrum with ventral teeth, rostral formula being $^{4}/_{2}$. Dactylus of first leg less than half as long as palm . . . . . *gorgonidarum*
— Rostrum without ventral teeth, rostral formula $^{6}/_{0}$. Dactylus of first leg slightly more than half as long as palm . . . . . *arabicus*
7. Lower margin of rostrum provided with teeth 8
— Lower margin of rostrum without teeth 9
8. Fingers of first pereiopod about twice as long as the palm . . . . . *novae-zealandiae*
— Fingers of first pereiopod subequal in length with the palm . . . . . *natalensis*

9. Both pairs of dorsal spines of the telson situated in the anterior part of the telson. Outer pair of spinules of the posterior margin of the telson placed distinctly before the submedian and intermediate pairs	*fimbriatus*
- Posterior dorsal pair of spines of the telson situated in or behind the middle of the telson. Outer pair of spinules of the posterior margin of the telson on the same level as the submedian and intermediate pairs	10
0. First two teeth of the rostrum placed on the carapace behind the posterior limit of the orbit	*robustus*
- All dorsal teeth of the rostrum placed anteriorly of the posterior limit of the orbit	11
. Lower margin of merus of second pereiopod with a row of granules or spines	12
- Lower margin of merus of second pereiopods entire	13
2. Scaphocerite slender, somewhat narrower distally than proximally. Rostrum with two dorsal teeth [1])	*bouvieri*
- Scaphocerite rather broad, widest anteriorly. Dorsal margin of rostrum with five teeth [1])	*minutus*
. Rostrum with 6 dorsal teeth [1]). Last three pereiopods with the dactylus distinctly biunguiculate and provided with minute denticles on the proximal part of the posterior margin	*spongicola*
Rostrum with 3 or 4 dorsal teeth [1]). Last three pereiopods with the dactylus simple or indistinctly biunguiculate, but never with denticles on posterior margin	*tridentatus*

Periclimenaeus truncatus (Rathbun) (figs. 48-50)

Coralliocaris truncata Rathbun, 1906, Bull. U.S. Fish Comm., vol. 23 pt. 3, p. 920, textfig. 70, pl. 24 fig. 2.

Coralliocaris truncata Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 385.

Siboga Expedition

Station 260, 2.3 miles N., 63° W. from the Northpoint of Nuhu Jaan, Kai Islands, 5° 36'.5 S, 132° 55'.2 E; Blake dredge; depth 90 m; bottom sand, coral and shells; December 16 and 18, 1899 — 1 specimen 12 mm.

Snellius Expedition

Ternate, pier; divinghood, about 4 m depth; April 1, 1930. — 1 juvenile specimen 6 mm.

In my adult specimen the rostrum reaches beyond the antennular peduncle, the basal part straight, the tip is strongly curved downward. The upper margin bears seven teeth, which all placed on the rostrum proper; the ultimate teeth are largest and placed more closely together n the others. The lower margin bears no teeth. In the juvenile specimen the rostrum shows exactly same shape as in R a t h b u n's figure. The carapase is smooth and provided with supraorbital and

1) The tip of the rostrum not included.

antennal spines. The supraorbital spine is very strong, broad, and sharply pointed, it reaches the line of separation between the cornea and the ophthalmic peduncle; when seen from above it covers the basal part of the eyes. The lower orbital angle is narrowly rounded. The antennal spine is strong and slightly remote from the anterior margin of the carapace. The anterolateral angle of the carapace is rounded.

The abdomen is smooth, the pleurae of the first three segments are rounded, those of the

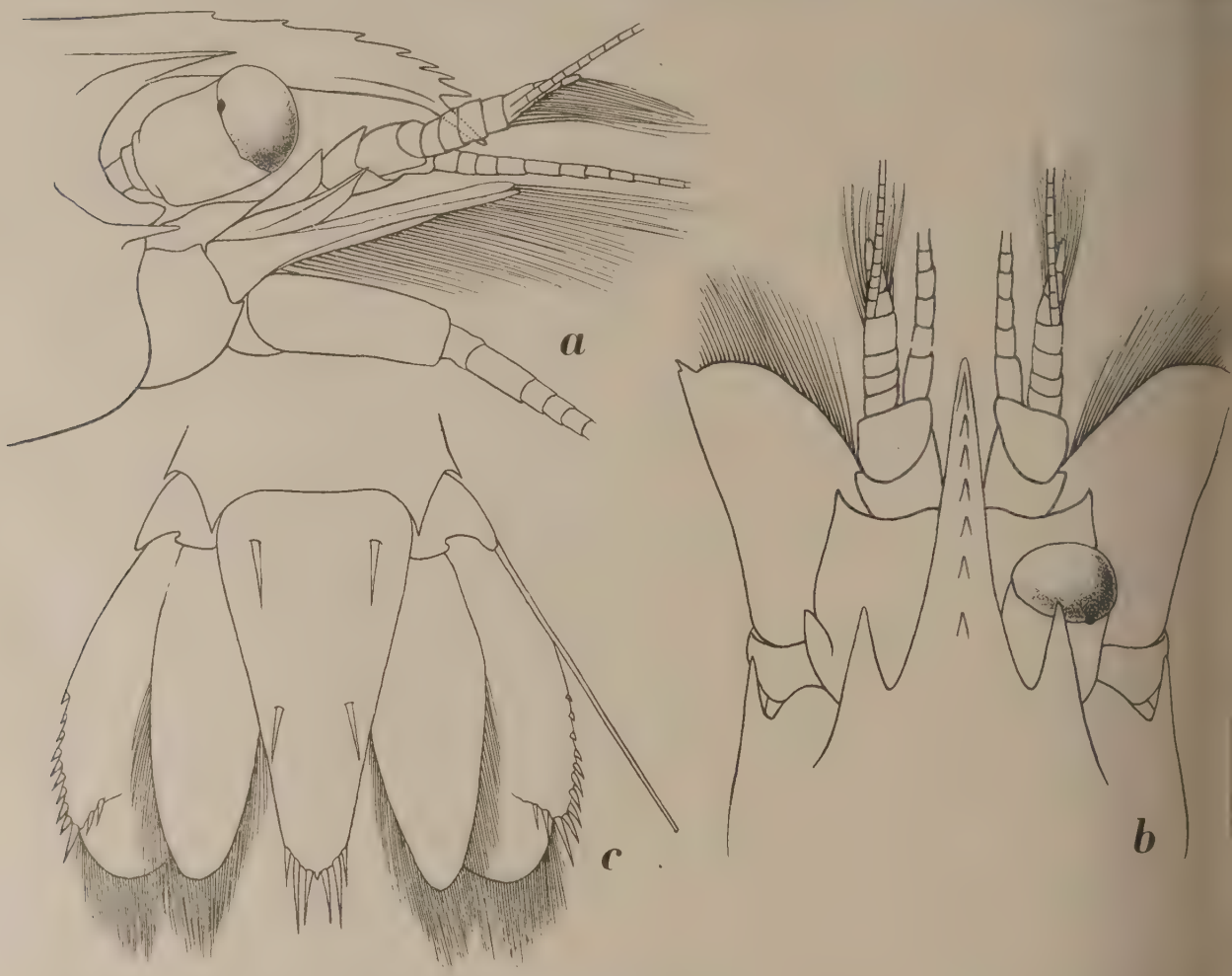


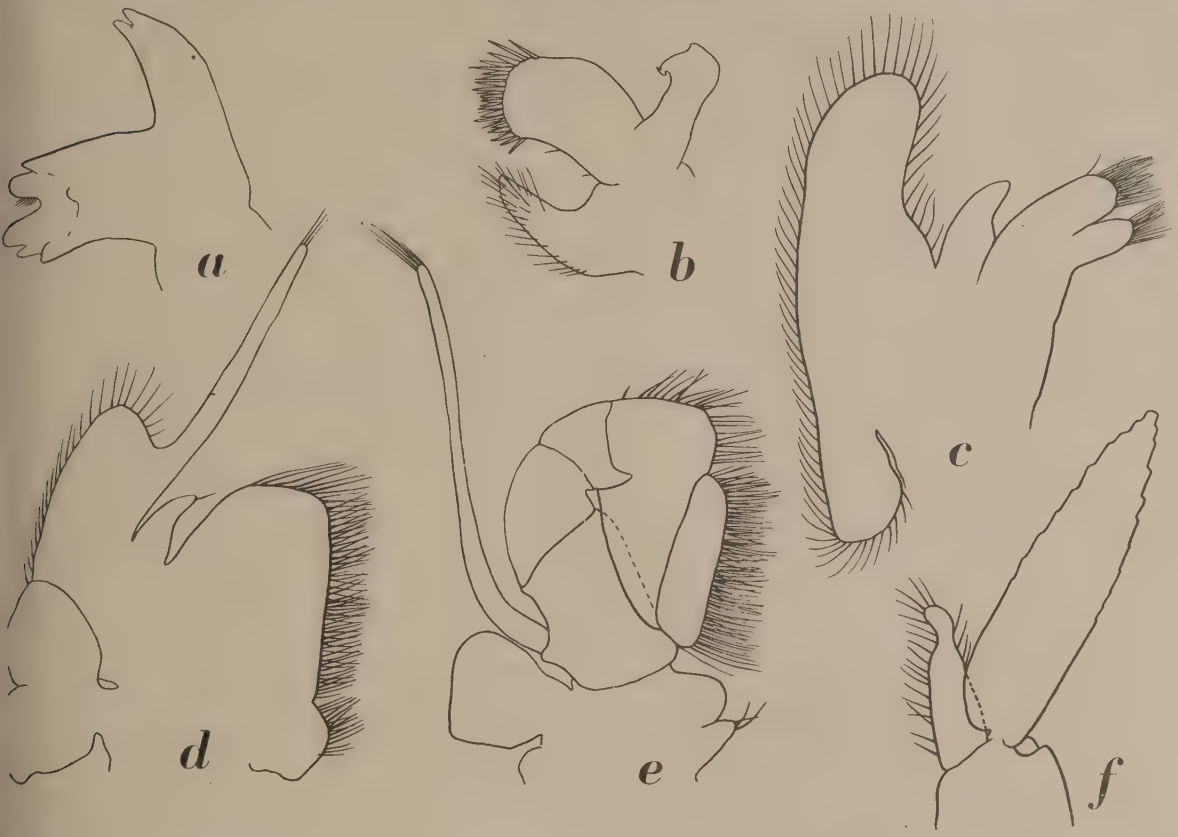
Fig. 48. *Periclimenaeus truncatus* (Rathbun). a, anterior part of body, lateral view; b, anterior part of body, dorsal view; c, telson and uropods, dorsal view. a-c, × 30.

fourth and fifth segments are bluntly topped. The posterolateral angle of the sixth abdominal segment, as well as its pleura are pointed. The sixth abdominal segment is longer than the fifth.

The telson (fig. 48c) is about twice as long as the sixth abdominal segment. The dorsal surface of it is provided with two pairs of very strong spines, the anterior of which is placed close to the anterior margin of the telson, the other pair is situated midway between the anterior pair and the posterior margin of the telson; the spines are distinctly remote from the lateral margins. The posterior margin of the telson is rounded, with a small acute median point; it bears three pairs of spines, the outer of which are shortest; the two inner pairs subequal.

The eyes are well developed and almost reach the end of the basal segment of the antennular eduncle. The cornea is hemispherical, distinctly shorter and somewhat broader than the stalk. The ellus is small but distinctly visible.

The basal segment of the antennular peduncle has the stylocerite ovate, ending in a distinct oint and directed obliquely outward. The outer margin of the segment is produced anteriorly of e stylocerite; a distinct anterolateral spine, which reaches to the middle of the second segment of e antennular peduncle, is present. The second and third segments are subequal and together some- hat more than half as long as the first segment. The upper antennular flagellum has the two rami



49. *Periclimenaeus truncatus* (Rathbun). a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, first pleopod of male. a-e, × 60; f, × 25.

ed for 4 segments; the free part of the shorter ramus is slightly shorter than fused part, it consists hree segments and is provided with many long hairs.

The scaphocerite reaches slightly beyond the rostrum. The outer margin is slightly sinuate. e lamella is broadest in the middle, the anterior margin is rounded. The final tooth is strong; in left scaphocerite of the Siboga specimen it is provided near its base at the outer side with a small essory denticle; it outreaches the lamella. The last segment of the antennal peduncle is long and hes about $^2/_3$ of the length of the scaphocerite.

The oral parts are figured here. The incisor process of the mandible (fig. 49a) ends in two h, between which a minute third tooth is visible; the molar process bears blunt knobs and a

very small number of spines. The maxillula (fig. 49b) has the upper lobe of the palp rather distinct. The inner lacinia of the maxilla (fig. 49c) is distinctly bilobed. The first and second maxilliped (figs. 49d, e) are normal in shape. The third maxilliped reaches somewhat beyond the last segment of the antennal peduncle. The last segment is ovate, measuring about 2/3 of the length of the penultimate segment. The antepenultimate segment is slightly longer than the penultimate, it is curved. The exopod almost reaches the end of the antepenultimate segment.

The first pereiopod (fig. 50a) reaches with slightly more than its chela beyond the scaphocerite.

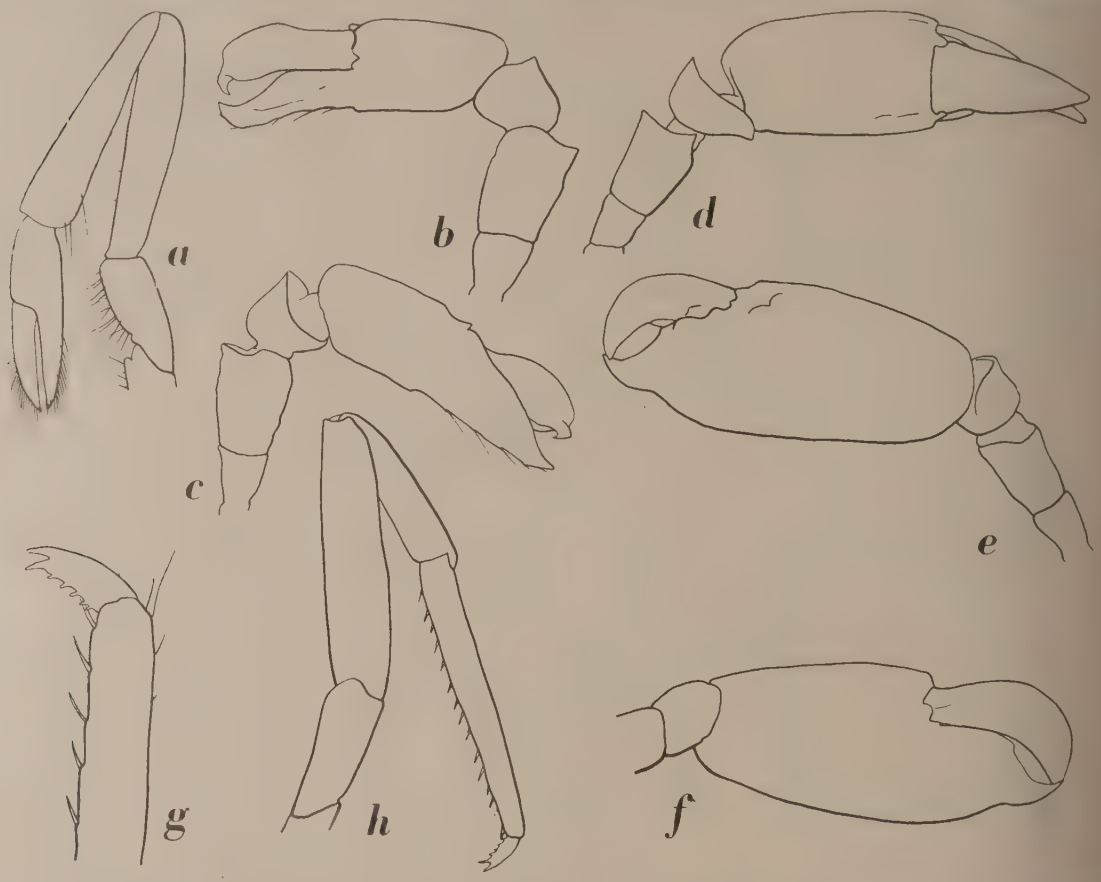


Fig. 50. *Periclimenaeus truncatus* (Rathbun). a, first pereiopod; b, left second pereiopod, external view; c, left second pereiopod, internal view; d, right second pereiopod, dorsal view; e, right second pereiopod, external view; f, right second pereiopod, internal view; g, dactylus third pereiopod; h, third pereiopod. a, h, × 28; b, c, × 12; d-f, × 10; g, × 67.

The fingers are slightly longer than the palm, the tips are provided with tufts of hair. The carpus is distinctly longer than the chela and about as long as the merus. The ischium is short. The second pereiopods (figs. 50b-f) are very unequal. In my specimen the right is much larger than the left, it reaches with entire chela beyond the scaphocerite. The fingers are about half as long as the palm the tips are crossing. The dactylus is strongly curved and provided at its outer side with a pit for the reception of a blunt tooth of the fixed finger; at its inner side it is provided with a blunt process which fits in a cavity of the fixed finger. The palm is swollen, and slightly granulate, its distal part and the basal part of the fixed finger are abruptly thickened in the lower region. Two blunt tubercles are present on the outer side of the palm near the articulation between the propodus and the dactylus

The carpus is very short, measuring about 1/3 of the length of the palm; anteriorly it is hollowed, so that the posterior part of the palm, which in the external part is produced posteriorly, fits in it. The merus is slightly longer than broad and is longer than the carpus. The ischium is short. The left pereiopod reaches with part of the chela beyond the scaphocerite. The fingers are slightly longer than the palm, peculiarly shaped, and in all probability not fit for nipping purposes. The dactylus is flat and broad, its tip is placed obliquely on the main body of the dactylus, giving this joint thereby a twisted appearance. The lower finger is flat, very broad at its base, at first gradually and finally abruptly narrowing in the erect tip. The palm is cylindrical. The carpus has a triangular shape, is about half as long as the palm, and is hollowed anteriorly. The merus is 1.5 times as long as the carpus. The ischium is slightly more than half as long as the merus. The third pereiopod (fig. 50h) reaches slightly beyond the scaphocerite. The dactylus (fig. 50g) is biunguiculate and has the posterior margin provided with about four minute denticles. The propodus is about 6 times as long as the dactylus, its posterior margin is provided with many spines. The carpus is somewhat more than half as long as the propodus. The merus is as long as the propodus, but is distinctly broader. The ischium is slightly shorter than the carpus. The fourth pereiopod is similarly built as the third, though it is more slender. Both fifth pereiopods are lacking in my specimens.

The endopod of the first pleopod of the male is peculiarly constricted before the apex (fig. 9f). The appendix masculina of the second pleopod in the male is shorter than the appendix interna.

The uropods are about as long as the telson. The exopod has the outer margin slightly convex and provided with many setae; the posterior part of this external margin bears a row of spines, which continues for a small distance on the diaeresis. The right uropod in the Siboga specimen bears a very long spine, which starts from below the process of the basal segment of the uropods, which overangs the articulation of this segment with the exopod; this spine reaches almost the end of the exopod, but the tip is broken. In the left uropod this spine is missing; in the Snellius specimen no such spine is present either.

The Snellius specimen is small and lacks several of the pereiopods. The remaining characters, however, show its identity without any doubt.

This species occupies a very isolated position in the present genus. It may be easily recognized by the enormous supraorbital spines, by the shape of the second pereiopods and by that of the uropods. A similar denticulation of the outer margin of the exopod is mentioned by N o b i l i for *Typhlocaris salentina*.

The only differences I could find between my specimen and R a t h b u n's description are:

The shape of the rostrum is slightly different in my large specimen; in my smaller specimen, however, it closely resembles R a t h b u n's figure.

R a t h b u n mentions two spines at the outer distal margin of the merus of the second pereiopod. No such spines could be found in my specimens.

It is possible that examination of R a t h b u n's type will reveal more differences, as her description is rather short and the photograph of the type is quite useless. Until the time that examination of the type is possible I regard my specimen to be identical with R a t h b u n's species.

Distribution. The only record in literature is from: Southcoast of Molokai, Hawaiian Archipelago (R a t h b u n, 1906) from a depth of 41 to 43 m.

Periclimenaeus arthrodactylus nov. spec. (figs. 51-53)

Siboga Expedition

Station 37, Sailus ketjil, Paternoster Islands; dredge; depth up to 18 m; bottom coral and coralsand. March 30 and 31, 1899. — 1 ovigerous female 10 mm.

The rostrum is slender and directed downward, the tip is slightly curved upward; it reaches slightly beyond the end of the basal segment of the antennular peduncle. The upper margin bears

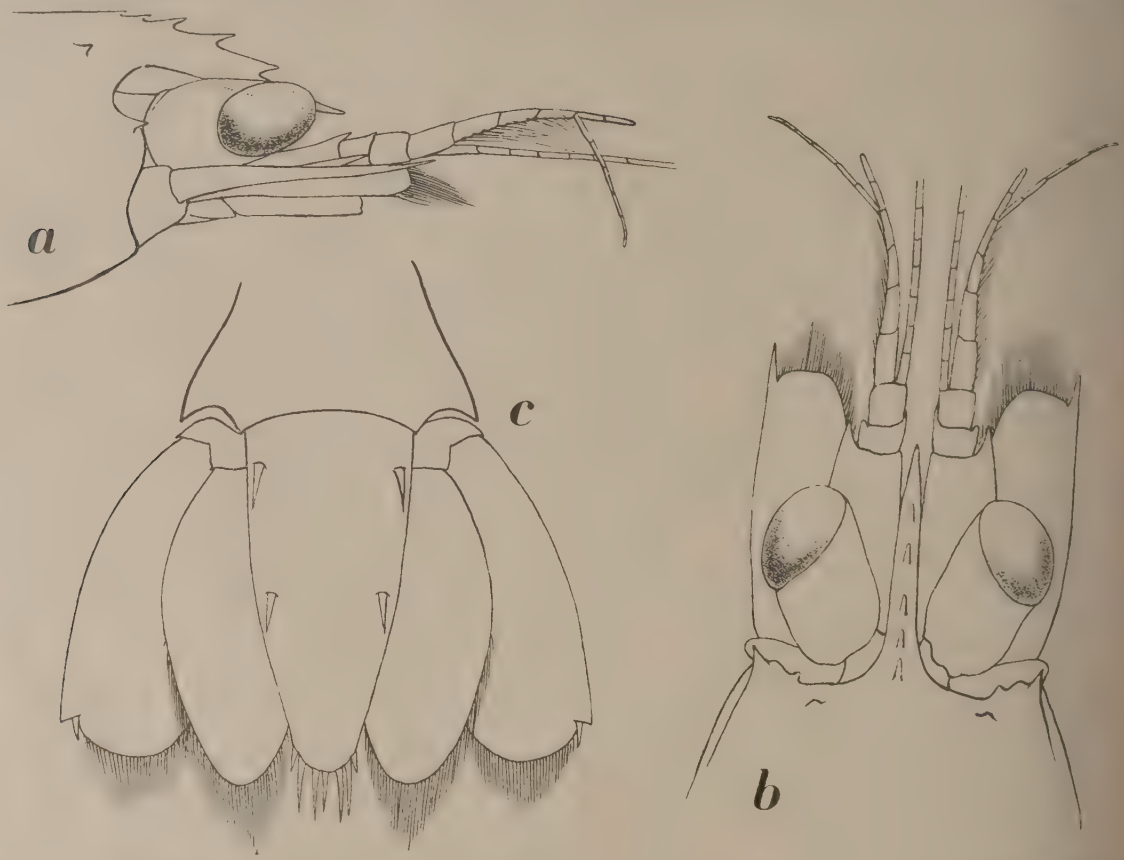


Fig. 51. *Periclimenaeus arthrodactylus* nov. spec. a, anterior part of body, lateral view; b, anterior part of body, dorsal view; c, telson and uropods, dorsal view. a-c, × 36.

five teeth, the first of which is situated over the posterior margin of the orbit. The distance between the distal tooth and the tip of the rostrum is much larger than the distance between the distal and the penultimate tooth. The lower margin of the rostrum is entire, convex. The carapace is smooth, slightly swollen and provided with a small supraorbital and a stronger antennal spine. The antennal spine is placed below the very narrow lower orbital angle and is slightly remote from the anterior margin of the carapace. The anterolateral angle of the carapace is rectangularly rounded.

The abdomen is smooth. The pleurae of the first three segments are broadly rounded, those of the fourth and fifth segments are narrower and shorter, that of the fourth segment is rounded, that of the fifth ends in a blunt point. The pleura of the sixth segment is bluntly triangular, the posterolateral angle of the segment is rounded. The sixth segment is as long as the fifth.

The telson (fig. 51c) is about twice as long as the sixth abdominal segment, and also twice as long as broad. The upper surface is provided with a shallow groove and with two pairs of long spines. The first pair is placed near the anterior margin of the telson, the posterior pair is slightly nearer to the anterior pair than to the posterior margin of the telson. This posterior margin is provided with four pairs of spinules. The outer pair is shortest, the three inner pairs all are about of the same length. The presence of an additional pair of spines at the posterior margin of the telson probably is an abnormality.

The eyes are well developed, they reach almost the end of the basal segment of the antennular peduncle. The cornea is as broad as, but shorter than the stalk.

The first segment of the antennular peduncle is broadened. The stylocerite is rather broad and suddenly ends in a sharp point, it is directed outward and fails to reach the middle of the basal segment. The outer anterolateral angle of this segment is provided with a strong spine, which reaches almost the end of the second segment. The second segment is shorter than and about as broad as the third, it has the outer anterolateral angle produced into a narrow rounded lobe, which reaches beyond

Fig. 52. *Periclimenaeus arthrodactylus* nov. spec. a, mandible; b, maxillula. a, × 100; b, × 42.

the articulation with the third segment. The upper antennular flagellum has the two rami fused for about four segments. The free portion of the shorter ramus consists of two segments and is slightly less than half as long as the fused part.

The scaphocerite reaches beyond the end of the antennular peduncle. The outer margin is straight or slightly convex and ends in a strong final tooth, which reaches far beyond the lamella. The lamella is about twice as long as broad and has the anterior margin rounded, it is broadest in the anterior part. The last segment of the antennal peduncle reaches about $^3/_4$ of the length of the scaphocerite; no spine is present at the base of the antennal peduncle.

The oral parts closely resemble those of the following species (figs. 52a, b). The third maxilliped reaches about the middle of the basal segment of the antennular peduncle. The ultimate segment measures about $^3/_4$ of the penultimate, which is broader distally than proximally. The antepenultimate segment is almost three times as long as the ultimate, it is broadest at its base and about three times as long as broad. The exopod reaches slightly beyond the end of the antepenultimate segment.

The first pereiopod (fig. 53a) is long and slender, and reaches with the carpus beyond the scaphocerite. The fingers are short, slender, and provided with tufts of setae. The palm is elongate, it is about 2.5 times as long as the fingers. The carpus is slender and somewhat more than twice as long as the palm. The merus is about as long as the carpus. The ischium is about $^2/_3$ of the length

of the merus. The second pereiopods (figs. 53b-d) are strong and slightly unequal. The stronger leg reaches with the carpus beyond the scaphocerite. The fingers measure almost 1/3 of the length of the palm, and have the tips crossing. The dactylus has the upper margin rounded, and is compressed in the anterior part. The cutting edge is provided with a strong truncate tooth in the proximal part; this tooth fits in a socket of the cutting edge of the fixed finger. The socket is flanked externally by a broad inconspicuous tooth, internally by a longer and more pointed tooth. The palm is swollen, its surface is rather rugose and is provided in the lower and anterior part with scattered stiff hairs. The carpus is short, triangular, and about 1/3 as long as the palm, it is unarmed. The merus is almost

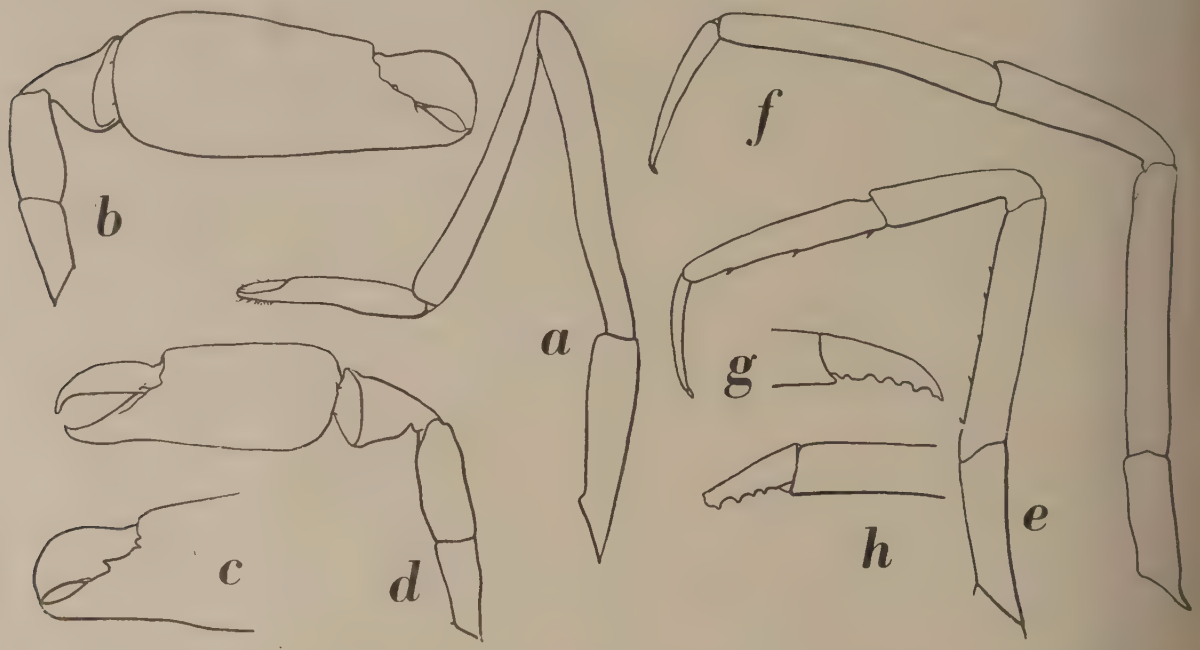


Fig. 53. *Periclimenaeus arthrodactylus* nov. spec. a, first pereiopod; b, larger second pereiopod, external view; c, fingers of larger second pereiopod, internal view; d, smaller second pereiopod; e, third pereiopod; f, fifth pereiopod; g, h, tips of dactylus of third and fifth pereiopods. a, e, × 36; b-d, × 18; g, h, × 86.

1.5 times as long as the carpus, rather slender, and with the lower part rugose. The ischium is about as long as the merus, here too the lower margin shows some rugosities. The shorter second pereiopod reaches with part of the carpus beyond the scaphocerite. The fingers are about 2/3 of the length of the palm and have the tips crossing. The cutting edge of the dactylus bears a tooth in the proximal part, which fits in a groove of the upper margin of the fixed finger. The palm is about 1.5 times as long as the carpus. The shape of the rest of the leg is similar to that of the stronger pereiopod. The last three legs are very peculiar in shape. The tip of the dactylus articulates with the rest of that segment, and is provided at the posterior margin with 4-6 small blunt teeth of equal size; the rest of the dactylus is very slender und unarmed. Of these three pairs of pereiopods in my specimen only two legs are present, one of them in all probability is one of the third legs, the other a fourth or fifth leg. In the supposed third leg (figs. e, g) the propodus is 1.5 times as long as the dactylus and five times as long as broad, some spinules are present along its posterior margin. The carpus measures about 5/7 of the length of the propodus. The merus is longer than the propodus and is 5 times as long

as broad, it too is provided with posterior spines. The ischium is more than half as long as the merus. The other leg (figs. f, h) is longer and more slender, it has furthermore the propodus and merus unarmed.

The uropods are about as long as the telson. The outer margin of the exopod is slightly convex and ends into two spines.

This species is remarkable for the shape of the dactylus of the last three pereiopods, by which it differs from all other Pontoniinae. The feature of the movable tip of the dactylus also may be observed in some species of the genus *Pontonia*. The species in all probability is most closely related to *P. rhodope*, with which species it agrees in the presence of a small supraorbital spine and in the general shape of the oral parts and of the first two pereiopods, the two species differ in the shape of the rostrum and in that of the last three pereiopods. The present species shows all characteristics of the genus *Periclimenaeus* and therefore is retained in that genus, notwithstanding its aberrant posterior legs.

Periclimenaeus rhodope (Nobili) (figs. 54-55bis)

Coralliocaris (*Onycocaris*) *rhodope* Nobili, 1904, Bull. Mus. Hist. nat. Paris, vol. 10, p. 233.
Coralliocaris (Onycocaris) rhodope Nobili, 1906, Bull. sci. France Belg., vol. 40, p. 49.
Coralliocaris (Onycocaris) rhodope Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 61, pl. 2 fig. 8.
Coralliocaris (Onycocaris) rhodope Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 385.
Onycocaris rhodope Kemp, 1922, Rec. Indian Mus., vol. 24, p. 278.

Siboga Expedition

Station 248, anchorage off Rumahlusi, northpoint of Tioor Island; dredge, townet and reef exploration; depth till 54 m; November 4 and 5, 1899. — 1 ovigerous female 20 mm.

The rostrum is straight or curved downward, it reaches to or beyond the end of the basal segment of the antennular peduncle and has the anterior margin more or less distinctly truncate. The upper margin bears seven to nine teeth, one tooth is present at the lower margin, sometimes it is absent (vid. N o b i l i, 1906b). One or two teeth of the upper margin are placed on the carapace behind the posterior orbital margin. The lateral carina of the rostrum is not confluent with the orbital margin, but forms a very indistinct postorbital ridge. The carapace is smooth and more or less swollen, it bears a small supraorbital and a strong antennal spine. The antennal spine is placed close to the lower orbital angle and is slightly remote from the anterior margin of the carapace. The anterolateral angle of the carapace is rounded.

The abdomen is smooth. The pleurae of the first four segments are broadly rounded, those of the fifth segment are truncate. The pleurae as well as the posterolateral angles of the sixth segment end in a sharp point. The sixth segment is as long as the fifth.

The telson (fig. 55bis a) measures $^3/_5$ of the length of the sixth abdominal segment and is 2.5 times as long as broad. The upper surface bears two pairs of spines, one in the anterior part of the telson and the other slightly closer to the anterior pair than to the posterior margin of the telson. The posterior margin bears three pairs of spines, the outer pair is shortest, the intermediate

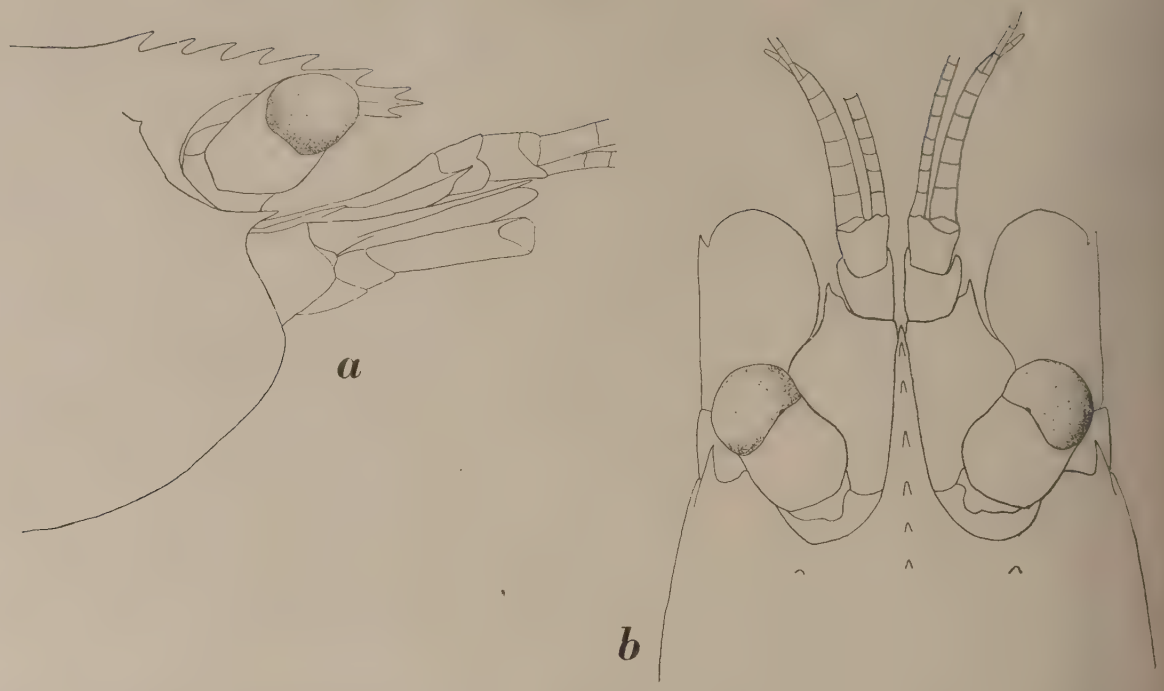


Fig. 54. *Periclimenaeus rhodope* (Nobili). a, anterior part of body, lateral view; b, anterior part of body, dorsal view. a, b, × 20.

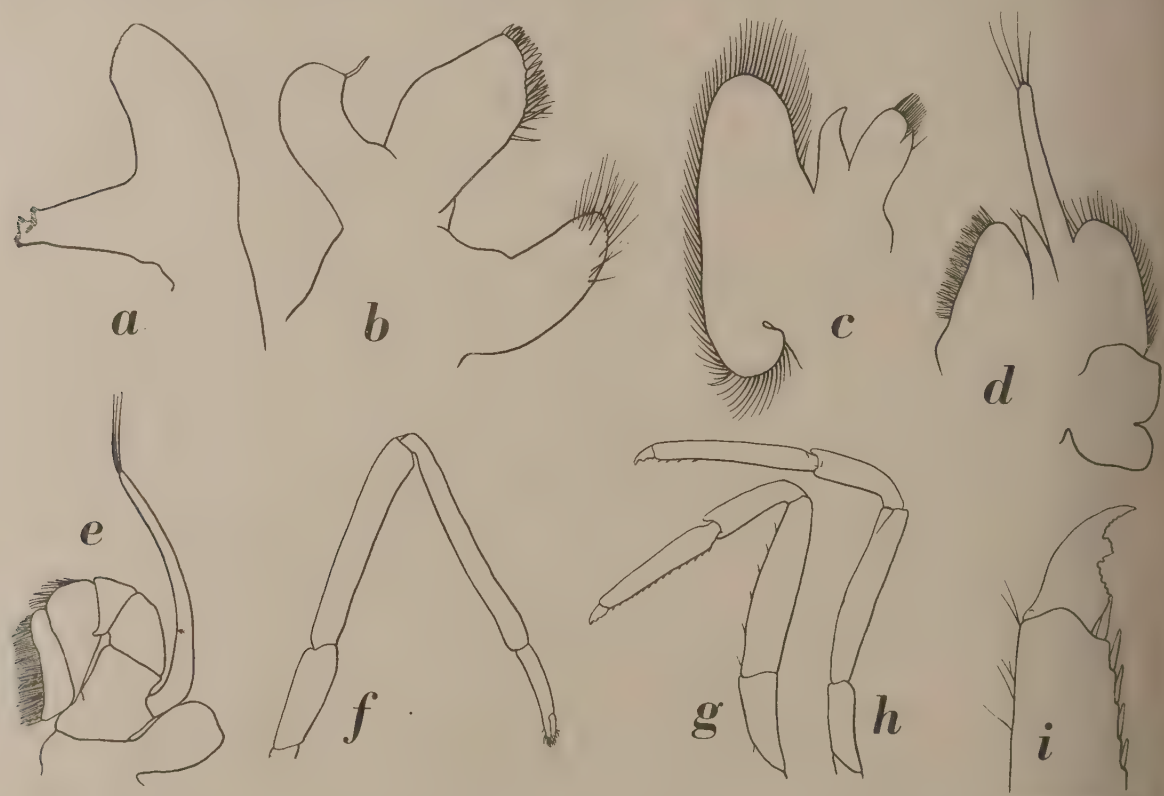


Fig. 55. *Periclimenaeus rhodope* (Nobili). a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, first pereiopod; g, third pereiopod; h, fifth pereiopod; i, dactylus of third pereiopod. a, b, i, × 60; c-e, × 25; f, × 18; g, h, × 15.

longest and the submedian slightly shorter than the intermediate. The dorsal surface of the telson is provided with scattered stiff hairs.

The eyes are well developed and reach about to the end of the basal segment of the antennular peduncle. The cornea is slightly narrower and much shorter than the stalk. No ocellus could be observed in my specimen.

The first segment of the antennular peduncle has the stylocerite rather broad, directed outward and suddenly narrowed into a sharp point. The outer margin of the basal segment is suddenly produced anteriorly of the stylocerite. The anterolateral spine is strong and reaches beyond the middle

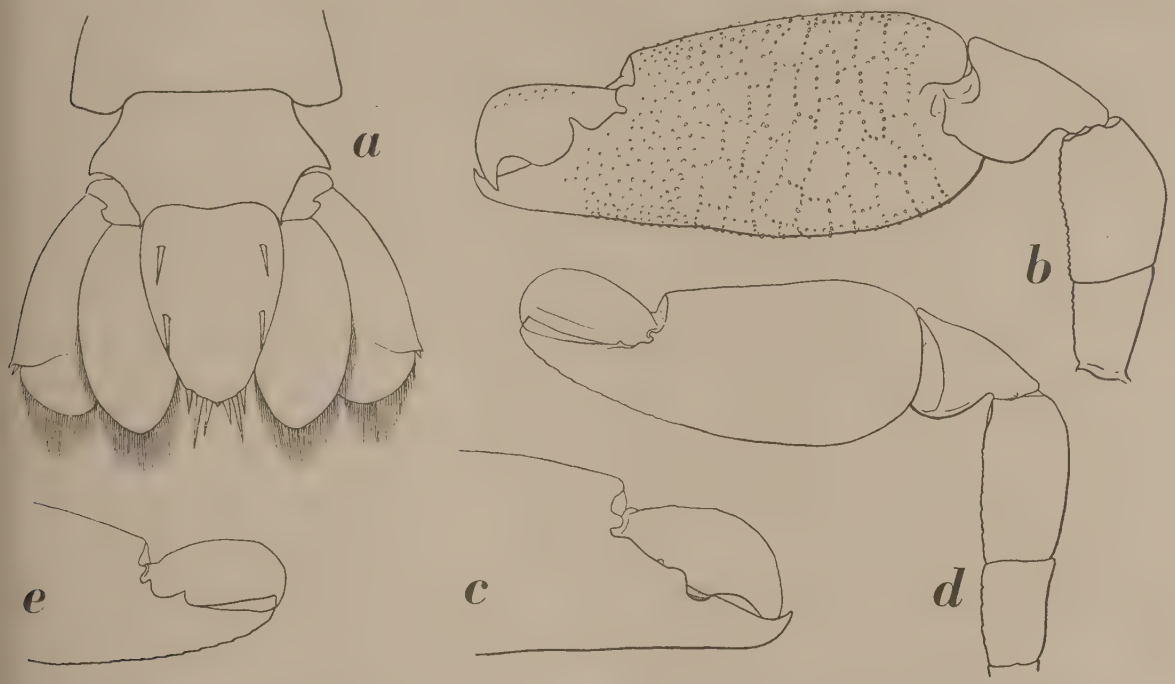


Fig. 55bis. *Periclimenaeus rhodope* (Nobili). a, telson and uropods, dorsal view; b, right second pereiopod, internal view; c, distal part of right second pereiopod, external view; d, left second pereiopod, external view; e, distal part of left second pereiopod, internal view. a, d, e, × 12; b, c, × 9.

of the second segment of the antennular peduncle. The outer anterolateral angle of the second segment is produced into a rounded lobe, which reaches beyond the articulation with the third segment. The third segment is slightly longer than the second; the second and third together are about half as long as the first segment. The upper antennular flagellum has the two rami fused for 5 joints. The free part of the shorter ramus consists of about 3 joints, being about 1/3 of the length of the fused part.

The scaphocerite reaches the end of the antennular peduncle. The outer margin is straight and ends in a strong final tooth, which almost fails to reach the end of the lamella. The lamella is twice as long as broad, with the greatest breadth in the anterior half. The antennal peduncle almost reaches the end of the scaphocerite.

The mandible (fig. 55a) strongly differs from that of *Periclimenaeus truncatus*; the incisor process narrows only slightly towards the apex and is provided there with numerous short and blunt teeth, which give the distal margin of the incisor process a crenulate appearance. The molar process shows few knobs and some rows of spines. The maxillula (fig. 55b) is typical, the palp bears

no upper lobe. The inner lacinia of the maxilla (fig. 55c) is only cleft in the distal part. The first two maxillipeds are typical (fig. 55d, e). The third maxilliped reaches the end of the basal segment of the antennular peduncle. The ultimate segment is about $^{5}/_{7}$ of the length of the penultimate. The antepenultimate segment is twice as long as the ultimate. The exopod is strong, and reaches beyond the end of the antepenultimate segment.

The first pereiopod (fig. 55f) is slender and reaches with part of the merus beyond the scaphocerite. The chela is very slender, being about 6 times as long as broad. The fingers are about half as long as the palm and have the tips provided with setae. The carpus is about twice as long as the chela, it is slightly narrower posteriorly than anteriorly. The merus is broader than and about as long as the carpus. The ischium is half as long as the merus. The second pereiopods (figs. 55bis b-e) are very strong and unequal. The stronger leg reaches with the chela and the carpus beyond the scaphocerite. The fingers are about half as long as the palm, are slightly curved inward and have the tips crossing. The dactylus is compressed in the anterior part of the upper margin, showing thereby a rounded dorsal ridge. The cutting edge of the dactylus bears a large bluntly truncate tooth, which fits in a socket of the fixed finger. This socket is flanked at the outer margin with a low blunt tooth, at the inner margin with a strong sharp one. The palm is greatly swollen and is about $^{3}/_{4}$ as broad as long. The surface is covered with many scattered tubercles, which in the proximal part are arranged in more or less distinct transverse and longitudinal rows. The tubercles are minute and only visible when seen under a strong magnification. The carpus is short and triangular, it is slightly less than half as long as the palm, broad anteriorly, strongly narrowed posteriorly and unarmed; in my specimen the tubercles on the carpus are extremely inconspicuous. The merus is half as long as the palm, slightly swollen and also provided with minute scattered tubercles in the lower part, it bears no spines. The ischium is compressed, it measures $^{3}/_{4}$ of the length of the merus and bears at the lower part of the outer surface some tubercles. The smaller pereiopod of the second pair reaches with the chela beyond the scaphocerite, it is more slender than the other leg. The fingers are more than half as long as the palm, and also curved outward; the tips are crossing; the cutting edges both of dactylus and fixed finger have one tooth very close to the base, the rest of the edge is entire. The shape of the other limbs of this leg is similar to that of the larger one, they only are shorter and slenderer. The third pereiopod (fig. 55g, i) reaches beyond the scaphocerite. The dactylus is broad at its base, narrowing towards the top, it is distinctly biunguiculate and has the posterior margin, including the lateral margins of the two claws, finely serrate. The propodus is almost six times as long as the dactylus and about 5 times as long as broad. The posterior margin is provided with spines over the entire length. The carpus measures $^{2}/_{3}$ of the length of the propodus. The merus is longer than the propodus, it is about four times as long as broad, and is provided with some posterior spinules. The ischium is half as long as the merus. The ischium and the carpus are not armed at the posterior margin. The fourth and fifth pereiopods (fig. 55h) are of the same shape as the third, only they are more slender and have the row of spinules on the propodus shorter, it namely is confined here to the distal part of the posterior margin; in the fourth pereiopod still some posterior spinules are present on the merus, while they are absent there in the fifth leg.

The uropods are longer than the telson. The exopod has the outer margin slightly convex and provided with setae, it ends into two spines.

My specimen presents the following small differences from N o b i l i's description:

1. The final tooth of the scaphocerite reaches only slightly beyond the lamella, while Nobili states that it distinctly outreaches the lamella in his specimens.
2. In his description Nobili states that the supraorbital spine is absent, while a distinct one is figured by him.
3. Nobili in his description says that the granulation of merus and ischium of the second pereiopods is limited to the upper border, giving this thereby a serrate form. Here he probably makes a mistake, as in his figure it is shown that the lower border of these joints in the second pereiopod is serrate, just like in my specimens.
4. The granulation of the carpus and propodus in Nobili's specimens seems to be more conspicuous than in my specimen.

These differences are so small and probably only due to incorrectness of Nobili's text or figures, that I can not attach any specific value to them. *P. rhodope* is closely related to the two following species, from which it mainly differs in the spinulation of the last three pereiopods.

Vertical distribution. Nobili (1906) records this species from a depth between 18 and 24 m. The Siboga specimen was obtained from a depth up to 54 m. Nothing is known of the association of this species with other animals.

Horizontal distribution. Records in literature are: Jibuti (Nobili, 1904, 1906b), Persian Gulf, between 25° 10′ N, 55° 10′ E and 24° 55′ N, 54° 40′ E (Nobili, 1906). The species now is recorded for the first time from the Malay Archipelago.

Periclimenaeus gorgonidarum (Balss)

Periclimenes gorgonidarum Balss, 1913, Zool. Anz., vol. 42, p. 236.
Periclimenes gorgonidarum Balss, 1914, Abh. Bayer. Akad. Wiss., suppl. vol. 2 pt. 10, p. 51, figs. 31, 32.
Periclimenes gorgonidarum Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 376.
Periclimenes gorgonidarum Kemp, 1922, Rec. Indian Mus., vol. 24, p. 138.
Periclimenes (*Periclimenaeus*) *gorgonidarum* Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 38, figs. 6-7.

Both Borradaile (1917a) and Kemp (1922) considered this species to be of incertain status and even suggested that it should not belong to the Pontoniinae at all. As already pointed out by Kubo (1940), there is no doubt that the present species belongs in the genus *Periclimenaeus* as it shows all characters of that genus. The fact that Balss only mentioned two spines at the end of the telson probably is due to the fact that he overlooked the other two pairs. Balss's description indeed is very short and a more extensive examination of the specimen certainly is needed; the shortness of the description by Balss, however, is largely compensated by the excellent figures of the anterior part of the body of the type specimen. The species is closely related to the following form and, as far as can be controlled, shows only some differences in the structure of the rostrum and the first pereiopod; in how far these differences are constant within the species, only can be ascertained with a much larger material (of *P. gorgonidarum* three, and of *P. arabicus* 1 specimen is known).

Vertical distribution. Balss records his specimen from a depth of 20 to 30 m. The specimen was associated with Gorgonaria, the species thus being the only representative of the genus known to be living on Coelenterata, all other members are associated with Porifera or Ascidia, or are of an unknown association.

Horizontal distribution. The species is known from: Sagami Bay near Misaki, Japan (Balss, 1913, 1914), Hurue, Kitaura-mura, Higasiusukigun, Miyazaki prefecture, Kyushyu, Japan (Kubo, 1940).

Periclimenaeus arabicus (Calman)

Periclimenes (*Periclimenaeus*) *arabicus* Calman, 1939, Sci. Rep. John Murray Exped., vol. 6, p. 210, fig. 4.

As already pointed out above the present species is closely related to *Periclimenaeus gorgonidarum,* especially the third to fifth legs show a remarkable close resemblance.

Vertical distribution. The only known specimen of this species was collected at a depth of 13.5 m. The species was found to live on the surface of a sponge.

Horizontal distribution. The species only is known from Calman's (1939) record from the South Arabian coast (19° 22'.6 N, 57° 53'.0 E).

Periclimenaeus novae-zealandiae (Borradaile)

Periclimenes (*Hamiger*) *novae-zealandiae* Borradaile, 1916, Nat. Hist. Rep. Brit. Antarct. Exped., vol. 3, p. 87, fig. 4.
Periclimenes (*Periclimenaeus*) *novae-zealandiae* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 167.

The present species is characterized by having the lower margin of the rostrum provided with teeth, a feature in this genus till now only met with in the present species, in *P. natalensis* and in the group of *P. rhodope.*

Kemp (1922) correctly regarded Borradaile's subgenus *Hamiger* to be identical with *Periclimenaeus.*

Vertical distribution. The type specimens, a male and a female, were collected at a depth of 128 m. Nothing is known about association with other animals.

Horizontal distribution. The types are recorded from 7 miles E. of North Cape, New Zealand.

Periclimenaeus natalensis (Stebbing)

Periclimenes natalensis Kemp, 1925, Rec. Indian Mus., vol. 27, p. 327.
"Palaemonetes" natalensis Barnard, 1950, Ann. S. Afr. Mus., vol. 38, pp. 791, 794.
Palaemonetes natalensis Stebbing, 1915, Ann. S. Afr. Mus., vol. 15, p. 78, pl. 19.

As Kemp (1925) already pointed out the species described by Stebbing as *Palaemonetes natalensis* does not at all belong to the Palaemoninae but is a Pontoniid prawn, as is shown by the presence of three pairs of spinules at the posterior margin of the telson. Kemp brings the species to the genus *Periclimenes* (in which genus he includes *Periclimenaeus* as a subgenus). As Stebbing, however, gives no definite statement about the dactylus of the last 3 pereiopods being simple or biunguiculate, Kemp does not place the species in one of his subgenera of *Periclimenes.* In my opinion, however, Stebbing's species shows all characteristic features of *Periclimenaeus,* so that I do not hesitate to place it in that genus. Stebbing makes a mistake, when he states that in his specimen the first pereiopods are lacking and the second legs are present: the figure which he gives of the "second" pereiopod distinctly is that of one of the first legs, as is shown by its slender shape

and by the presence of cleaning bristles in the anteroventral part of the carpus and in the posteroventral part of the propodus, these bristles always being present in the first pereiopods and invariably lack in the second.

The species is most closely related to *Periclimenaeus novae-zealandiae,* but differs from it in the shape of the rostrum and by having the fingers of the first pereiopods much shorter. Perhaps the second pereiopods, which are lacking in the type and only specimen of *P. natalensis,* will show more differences with those of *P. novae-zealandiae.*

Vertical distribution. Like *P. novae-zealandiae,* the present species was collected in deeper water; it has been found at a depth of about 800 m.

Horizontal distribution. The species is known only from Stebbing's (1915) specimen from Cape Natal, N. by E. 24 miles.

Periclimenaeus fimbriatus Borradaile

Periclimenaeus fimbriatus Borradaile, 1915, Ann. Mag. nat. Hist., ser. 8 vol. 15, p. 213.
Periclimenaeus fimbriatus Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, pp. 324, 379, pl. 55 fig. 19.
Periclimenes (*Periclimenaeus*) *fimbriatus* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 167.

The spines on the telson of the present species show the same arrangement as in the previous two species. The present species differs, however, from the two others in the shape of the rostrum, of the second legs and in the shape of the dactyli of the last three pereiopods.

Vertical distribution. The species was collected between 70 and 90 m.

Horizontal distribution. Records in literature are: Providence Island, south of the Seychelles (Borradaile, 1915, 1917a), Mulaku Atoll, Maldive Archipelago (Borradaile, 1915, 1917a).

Periclimenaeus robustus Borradaile

Periclimenaeus robustus Borradaile, 1915, Ann. Mag. nat. Hist., ser. 8 vol. 15, p. 213.
Periclimenaeus robustus Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, pp. 324, 378, pl. 55 fig. 20.
Periclimenes (*Periclimenaeus*) *robustus* Kemp, 1922, Rec. Indian Mus., vol. 22, p. 167.

Vertical distribution. The species has been collected between 52 and 70 m.

Horizontal distribution. Borradaile (1915, 1917a) recorded the species from the Amirante Islands, Western Indian Ocean.

Periclimenaeus bouvieri (Nobili) (fig. 56)

Typton Bouvieri Nobili, 1904, Bull. Mus. Hist. nat. Paris, vol. 10, p. 233.
Typton Bouvieri Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 67, pl. 3 fig. 4.
Typton bouvieri Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 395.
Typton bouvieri Kemp, 1922, Rec. Indian Mus., vol. 24, p. 286.
Typton bouvieri Balss, 1927, Trans. zool. Soc. Lond., vol. 22, p. 223.

Five syntypes of the present species, measuring 11 to 19 mm, are preserved in the collection of the Istituto e Museo di Zoologia della Università in Turin, Italy. Two of the specimens are ovigerous females of 18 and 19 mm. The material was collected by Dr. H. Coutière in Jibuti. It was examined by me in Turin and in Leiden.

The rostrum (fig. 56a) is short and reaches to or slightly beyond the eyes. It ends in a sharp point and bears two teeth on the upper margin in front of the posterior limit of the orbit. No ventral teeth are present. The carapace bears only a strong and pointed antennal spine. The anterolateral angle of the carapace is distinctly forwards produced. In the females the carapace is swollen. Both carapace and abdomen have the surface smooth.

The pleurae of the first four abdominal segments are broadly rounded. Those of the fifth and sixth segments are pointed, just like the posterolateral angle of the latter segment. The sixth segment is slightly longer than the fifth and measures almost $^2/_3$ of the length of the telson. The two

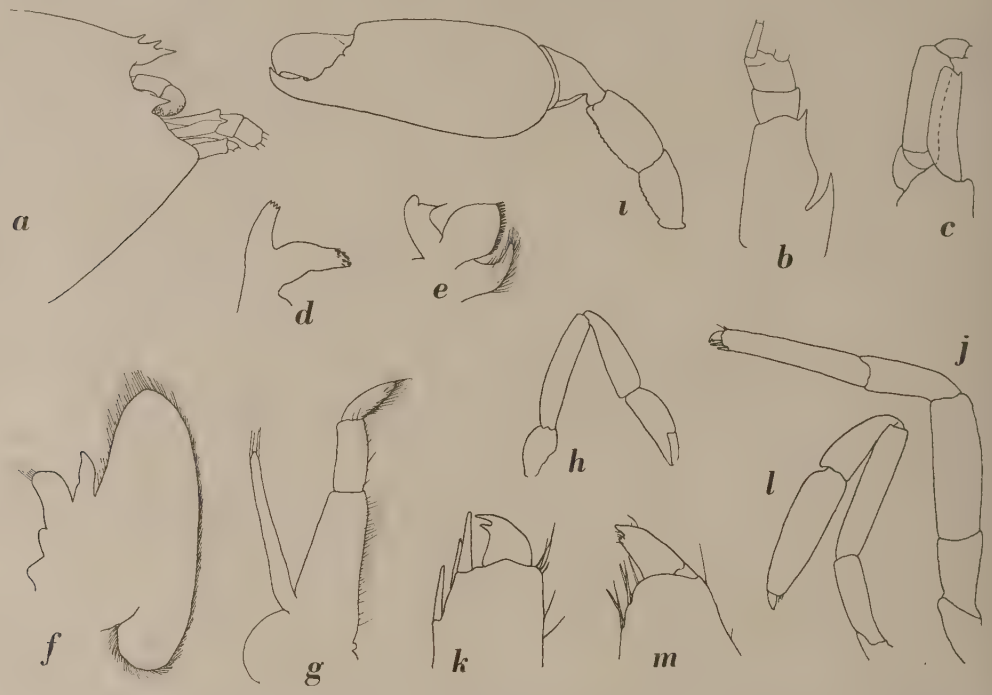


Fig. 56. *Periclimenaeus bouvieri* (Nobili), syntype. a, anterior part of body in lateral view; b, antennular peduncle; c, antennal peduncle; d, mandible; e, maxillula; f, maxilla; g, third maxilliped; h, first pereiopod; i, larger second pereiopod; j, third pereiopod; k, dactylus and part of propodus of third pereiopod; l, fifth pereiopod; m, dactylus and part of propodus of fifth pereiopod. a, h, j, l, × 10; b, c, f, × 18; d, e, × 20; i, × 7; k, m, × 50.

dorsal pairs of spinules of the telson are small and placed rather close to the lateral margins. The anterior pair of spinules lies somewhat behind the middle of the telson, the posterior pair stands about halfway between the anterior pair and the posterior margin of the telson. This posterior margin bears six spines, which are placed in one row.

The eyes are rather small. The cornea is rounded, it is shorter and narrower than the eyestalk.

The stylocerite (fig. 56b) is strong and sharply pointed, it is directed forwards. The outer margin of the basal segment of the antennular peduncle is somewhat laterally produced at the level of the tip of the stylocerite. The anterolateral angle of the segment is produced into a sharp spine. The second segment is somewhat shorter than the third. The flagella are broken in the material seen by me.

The scaphocerite (fig. 56c) is small, it reaches slightly beyond the end of the basal joint of the antennular peduncle and is of about the same breadth throughout. It is somewhat less than four

times as long as broad. The outer margin is slightly concave and ends in a small tooth, which is overreached by the lamella. The last joint of the antennal peduncle slightly overreaches the scaphocerite. There is no outer spine near the base of the scaphocerite.

The incisor process of the mandible (fig. 56d) ends in four narrow teeth. The maxillula (fig. 56e) has the upper lacinia rather broad, the lower is slender; the palp is bilobed. The maxilla (fig. 56f) has the upper endite undivided, the palp is normal, the scaphognathite is well developed and not very broad. The first and second maxillipeds are typical in shape. The third maxilliped (fig. 56g) reaches about to the middle of the scaphocerite. The last joint is somewhat shorter than the penultimate; these two joints together are somewhat shorter than the antepenultimate joint. The exopod reaches far beyond the end of the antepenultimate joint. In the males the maxilliped is more slender than in the females and the exopod reaches only slightly beyond the antepenultimate joint.

The first legs (fig. 56h) reach with the carpus and the chela beyond the scaphocerite. The fingers are shorter than the palm. The latter is rather thick. The carpus is slightly longer than the chela and is distinctly shorter than the merus. The second legs for the larger part are detached in my material, but the left and right legs obviously are unequal. The stronger of the two (fig. 56i) has the fingers somewhat less than half as long as the palm. The dactylus has the upper margin convex, while the lower margin bears a strong hammer-shaped tooth, which fits in a cavity of the fixed finger. This cavity is provided at its inner margin with a distinct tooth. The palm is swollen and smooth or somewhat rugose. The carpus is slightly less than half as long as the palm, it bears a blunt longitudinal carina along the outer side. The merus is somewhat longer than the carpus and bears some tubercles on the lower surface. The ischium is shorter than the merus and also bears ventral tubercles. The smaller second leg differs from the larger by being more slender, by lacking the hammer-shaped tooth on the dactylus and by lacking the tubercles on the merus and ischium. The third leg (fig. 56j) reaches with the larger part of the carpus beyond the scaphocerite. The dactylus (fig. 56k) is very short, being overreached by the distal spine of the lower margin of the propodus. It is strongly curved and ends in two sharp claws. The propodus is about 10 times as long as the dactylus. The posterior margin bears some spines in the extreme distal part. The carpus measures $^3/_5$ of the length of the propodus. The merus is slightly shorter than the propodus. The ischium is half as long as the merus. The fifth leg (fig. 56l) reaches with part of the propodus beyond the scaphocerite. As only one of the specimens examined by me bears a fifth leg, I do not know whether or not the shape shown by this leg is normal. The dactylus (fig. 56m) is short and ends in two blunt claws. The propodus is very broad, most strongly so in the basal part, narrowing somewhat towards the top. It bears some spine-like hairs in the extreme distal part. The carpus also is broad, it measures $^3/_5$ of the length of the propodus. The merus is far more slender and has about the same length as the propodus. The ischium is more than half as long as the merus.

The endopod of the first pleopod of the male is rather large and is oval in outline. It has about $^2/_3$ of the length of the exopod. In the second pleopod of the male the appendix interna and the appendix masculina are of about equal length. The endopod of the uropod is somewhat longer than the telson, the exopod is slightly shorter than the endopod. The outer margin of the exopod is convex and naked, it ends into two teeth, the inner of which is movable.

The present species was considered by Nobili to belong in *Typton*. The type specimens, however, distinctly show that it cannot be placed in that genus, and that it belongs in *Periclimenaeus*.

Distribution. The species has only been recorded twice in literature: 8 km south of quarantine pier, Suez (Balss, 1927), Jibuti (Nobili, 1904, 1906b). It is not known whether or not the species is associated with other marine invertebrates.

Periclimenaeus minutus nov. spec. (figs. 57-59)

Siboga Expedition

Station 240, Banda anchorage; trawl, dredge and reef exploration; 9-36 m depth; bottom black sand and coral, lithothamnion bank in 18-36 m; November 22 till December 1, 1899. — 2 specimens (one of which an ovigerous female) both 7 mm.

The rostrum is slightly directed downward, while the extreme tip is curved upward; it reaches to or beyond the end of the first segment of the antennular peduncle. The dorsal margin is provided with five teeth, which all are placed on the rostrum proper, the lower margin is convex and devoid

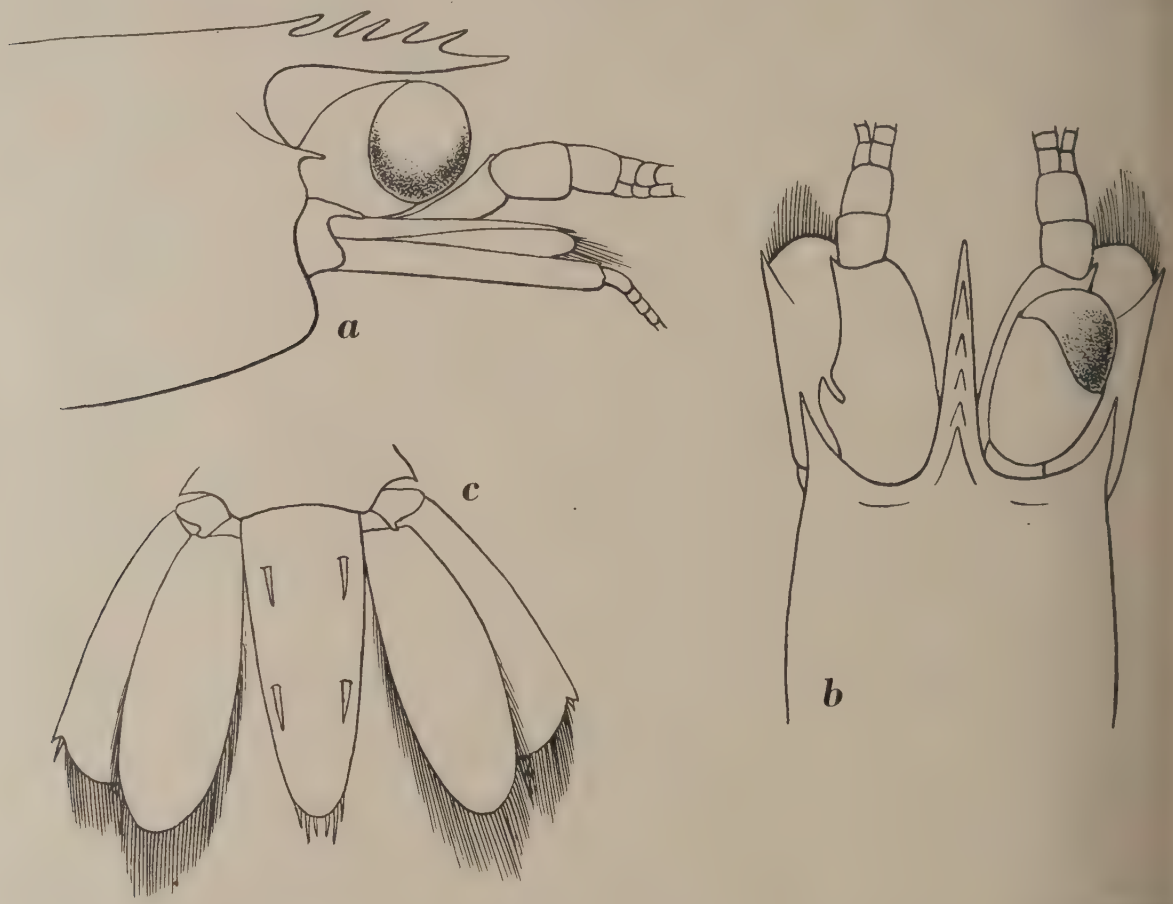


Fig. 57. *Periclimenaeus minutus* nov. spec. a, anterior part of body, lateral view; b, anterior part of body, dorsal view; c, telson and uropods, dorsal view. a-c, × 40.

of teeth. The carapace is smooth or slightly areolated. The postorbital ridge is indistinct. The antennal spine is strong and placed almost at the lower angle of the orbit. The anterolateral angles of the carapace are rounded, and produced slightly forwards.

The abdomen is smooth. The pleurae of the first five segments are rounded, that of the sixth is produced in a posteriorly directed point. The posterolateral angle of the sixth segment is rounded. The sixth segment has the same length as the fifth.

The telson (fig. 57c) is almost twice as long as the sixth abdominal segment, it gradually narrows posteriorly. The dorsal surface bears two pairs of spines: the anterior pair is placed close to the anterior margin of the telson, the posterior pair lies about midway between the anterior pair and the posterior margin of the telson. The anterior spines are more remote from the lateral margins than the posterior are. The posterior margin of the telson bears the usual three pairs of spinules, the outer of which are shortest, the intermediate longest and the inner pair slightly shorter than the intermediate.

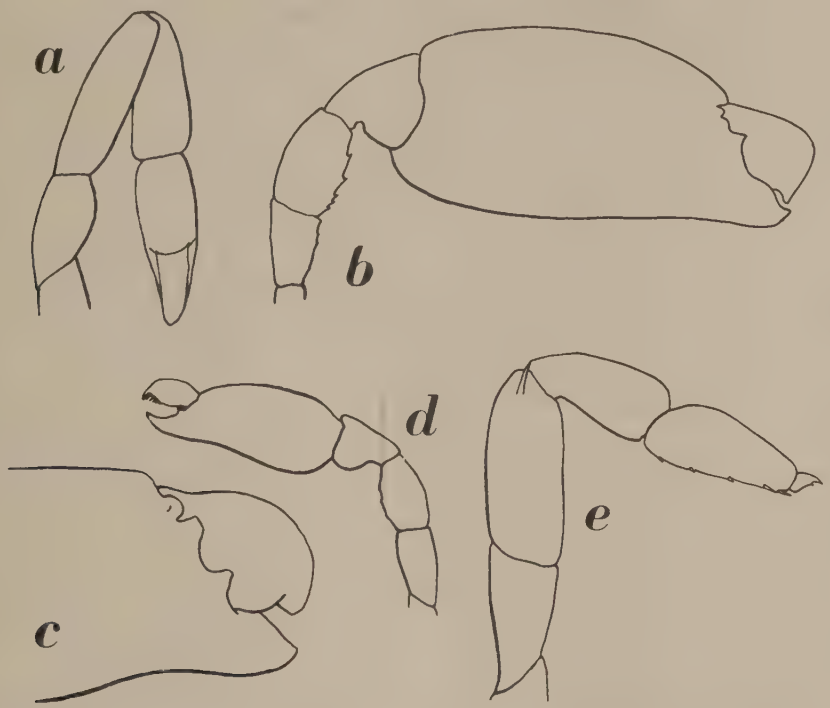


Fig. 58. *Periclimenaeus minutus* nov. spec. a, first pereiopod; b, larger second pereiopod, internal view; c, distal part of larger second pereiopod, external view; d, smaller second pereiopod, internal view; e, third pereiopod. a, e, × 36; b, d, × 18; c, × 27.

The eyes are distinct, the cornea is hemispherical, slightly shorter than and about as broad as ıe stalk. The tip of the eye reaches about 3/4 of the length of the rostrum.

The stylocerite is broad and ends abruptly in an acute point, it is directed obliquely outward. he basal segment of the antennular peduncle has the outer margin triangularly produced distally f the stylocerite; the anterolateral angle of the segment is produced into a minute tooth. The second gment is as broad and about as long as the third. The flagella are broken in both specimens at my isposal.

The scaphocerite is short and reaches only slightly beyond the end of the rostrum, it fails reach the end of the antennular peduncle. The lamella is broadest anteriorly and has the anterior argin rounded. The final tooth fails or almost fails to reach the end of the lamella. The outer

margin of the scaphocerite is almost straight. The antennal peduncle is not provided with an outer spine; the last segment of the peduncle is long and reaches distinctly beyond the scaphocerite.

The incisor process of the mandible (fig. 59) ends in two teeth; the molar process bears numerous brush-like arranged spines. The maxillula is quite typical in shape, the palp bears a feeble upper lobe. The inner lacinia of the maxilla is cleft in the distal part. The first two maxillipeds are typical. The third maxilliped fails to reach the end of the basal segment of the antennular peduncle. The ultimate segment is slightly shorter than the penultimate and about half as long as the antepenultimate, which is slightly curved. The exopod reaches beyond the antepenultimate segment.

The first pereiopod (fig. 58a) reaches with a large part of the carpus beyond the scaphocerite. The fingers are about as long as or slightly shorter than the palm. The tips are provided with setae. The carpus is about as long as the chela and slightly shorter than the merus. The second pereiopods (fig. 58b-d) are very unequal. In one of the two specimens the right, in the other the left pereiopod is stronger. The stronger leg reaches with the carpus and the chela beyond the scaphocerite. The

Fig. 59. *Periclimenaeus minutus* nov. spec. mandible. × 200.

chela is much swollen, the fingers are thick and blunt, they measure about one third of the length of the palm. The dactylus has the upper margin strongly convex, the cutting edge bears a strong truncate process, which fits in a cavity of the fixed finger. The inner margin of the cutting edge of the fixed finger bears a broad, triangular and pointed tooth near the base; the outer margin of the cutting edge is provided with two truncate teeth. The carpus is about $^1/_3$ of the length of the palm and much narrower than it. The merus is slightly longer than the carpus, it is broad and provided on the lower margin with a row of 5 to 7 distinct teeth. The ischium is short. The other leg of the second pair is much slenderer. The dactylus is longer than the fixed finger and provided in the anterior part of its cutting edge with a pectination of small teeth. The dactylus is about $^1/_3$ of the length of the palm. The palm is cylindrical. The carpus is slightly less than half as long as the palm. The merus is longer than the carpus; as in the stronger leg it also bears some ventral teeth. The third pereiopod (fig. 58e) reaches with the propodus and a part of the carpus beyond the scaphocerite. The dactylus is about $^1/_5$ of the length of the propodus, it is biunguiculate. The propodus is slightly less than thrice as long as broad, it is broadest at base and has the posterior margin provided with some spinules. The carpus is about as long as the propodus. The merus is longer and broader than the propodus. The ischium is slightly more than half as long the merus. All segments are relatively broad. The fourth and fifth pereiopods are about similarly built as the third, but they are more slender.

The uropods are slightly longer than the telson. The exopod is shorter than the endopod, its outer margin is convex and ends into two spines, a row of setae is present along the lower border of the outer margin. The posterior margin of the exopod is broadly rounded and not much produced posteriorly.

The species is closely related to *P. tridentatus,* from which it at once may be distinguished by the ventral spines on the merus of the second pereiopods, by the much smaller size and by the shorter first pereiopods.

Periclimenaeus spongicola nov. spec. (figs. 60-62)

Museum Leiden

Java Sea, 4° 41′ S, 113° 2′ E; Gier Expedition G. 12 E. 5; depth 28-32 m; October 8, 1908; in sponge. — 1 ovigerous female 11 mm.

The rostrum is slender, slightly directed downward, with the tip curved upward, it reaches about to the end of the basal segment of the antennular peduncle. The upper margin of the rostrum bears six teeth, the first of which is smallest and placed just over the posterior margin of the orbit, the other teeth are placed regularly over the rest of the rostrum, they become longer and more slender distally. The lower margin of the rostrum is convex and bears no teeth at all. The carapace is smooth and swollen, it is provided with a strong postorbital ridge,which ends in a very strong antennal spine, which is placed on the lower orbital angle. The anterolateral angle of the carapace is rounded and forwards produced.

The abdomen is smooth and as high as the thorax. The pleurae of the first five segments are broadly rounded. The pleura of the sixth segment is triangular in shape, with a sharp posteriorly directed apex; the posterolateral angles of the sixth segment have the tips rounded. The sixth segment is about as long as the fifth.

The telson (fig. 60c) is twice as long as the sixth abdominal segment and is about twice as long as broad. There are two pairs of long dorsal spines, the first of which is placed in the anterior quarter of the telson, the other pair is situated about midway between the anterior pair and the posterior margin of the telson. This posterior margin bears three pairs of spines: the external pair is shortest, the intermediate is longest, while the submedian pair is slightly shorter and narrower than the intermediate.

The eyes are well developed and reach about to the end of the rostrum; the cornea is hemispherical, it is slightly shorter and narrower than the eyestalk.

The basal segment of the antennular peduncle has the stylocerite short and broad, with a rather blunt apex, this stylocerite is directed obliquely outward. Slightly before the stylocerite the lateral margin of the basal segment is distinctly triangularly produced laterally. The anterolateral spine of the basal segment is very small. The second segment of the peduncle is somewhat shorter than the third, together these two segments measure somewhat more than half the length of the first segment. The upper antennular flagellum has the two rami fused for about four segments, the free portion of the shorter ramus is very small and consists of two joints only.

The scaphocerite is short, it fails to reach the end of the second segment of the antennular

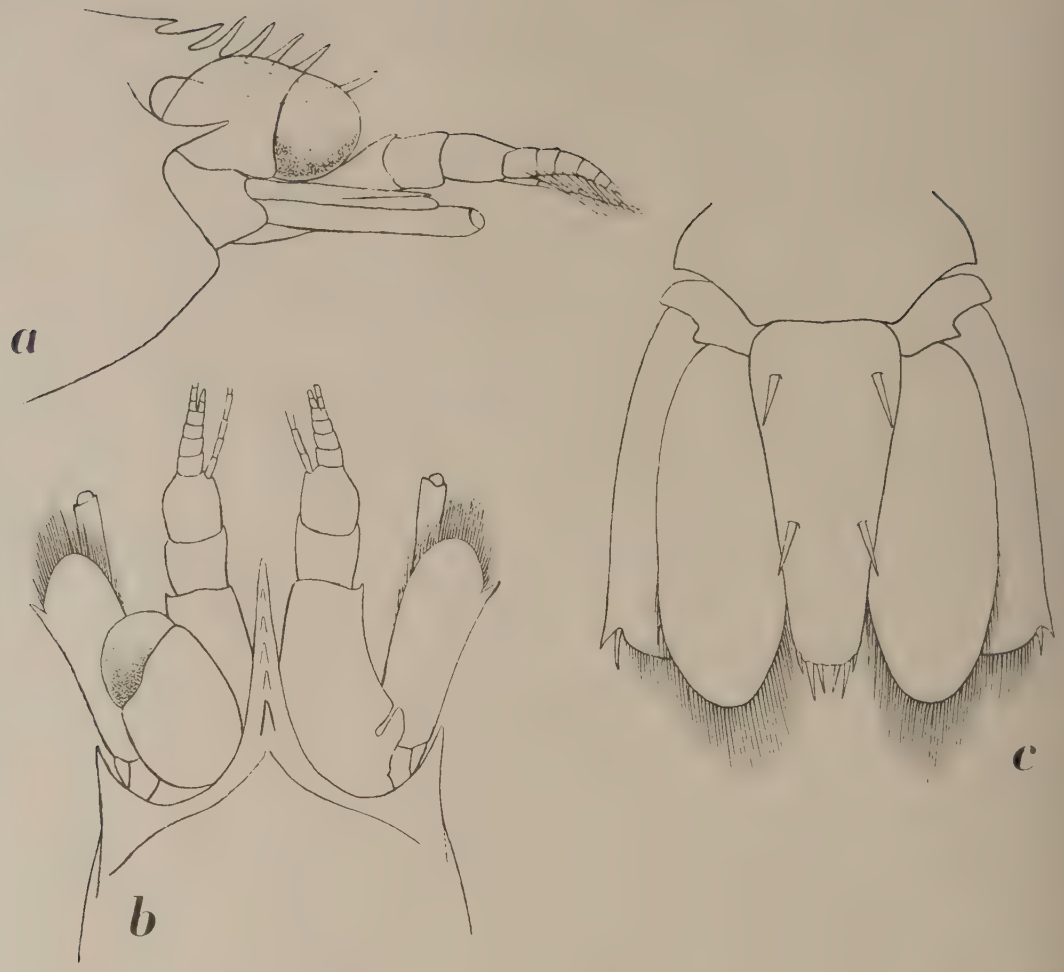


Fig. 60. *Periclimenaeus spongicola* nov. spec. a, anterior part of body, lateral view; b, anterior part of body, dorsal view; c, telson and uropods, dorsal view. a-c, × 35.

Fig. 61. *Periclimenaeus spongicola* nov. spec. a, mandible; b, palp and upper lacinia of maxillula; c, maxilla. a, b, × 120; c, × 60.

peduncle. The outer margin is about straight and ends in a strong, somewhat outwards directed final tooth; the lamella has the anterior margin broadly rounded and reaches slightly beyond the final tooth. The scaphocerite is broadest in the anterior half. The last segment of the antennal peduncle reaches distinctly beyond the apex of the scaphocerite. No external tooth is present in the basal part of the antennal peduncle.

The mandible (fig. 61a) has the incisor process ending in three teeth, a small movable spine is present in the basal part of the convex margin of the incisor process; the molar process ends in some blunt teeth and is provided with spines. The maxillula (fig. 61b) has the palp indistinctly cleft, the inner lacinia is narrow. The maxilla (fig. 61c) has the endite shallowly bilobed. The first maxilliped shows no notch between the basis and the coxa, the epipod is distinctly bilobed. The second maxilliped is normal in shape, no podobranch is present. The third maxilliped reaches about to the middle of the basal segment of the antennular peduncle. The last segment is somewhat shorter than the

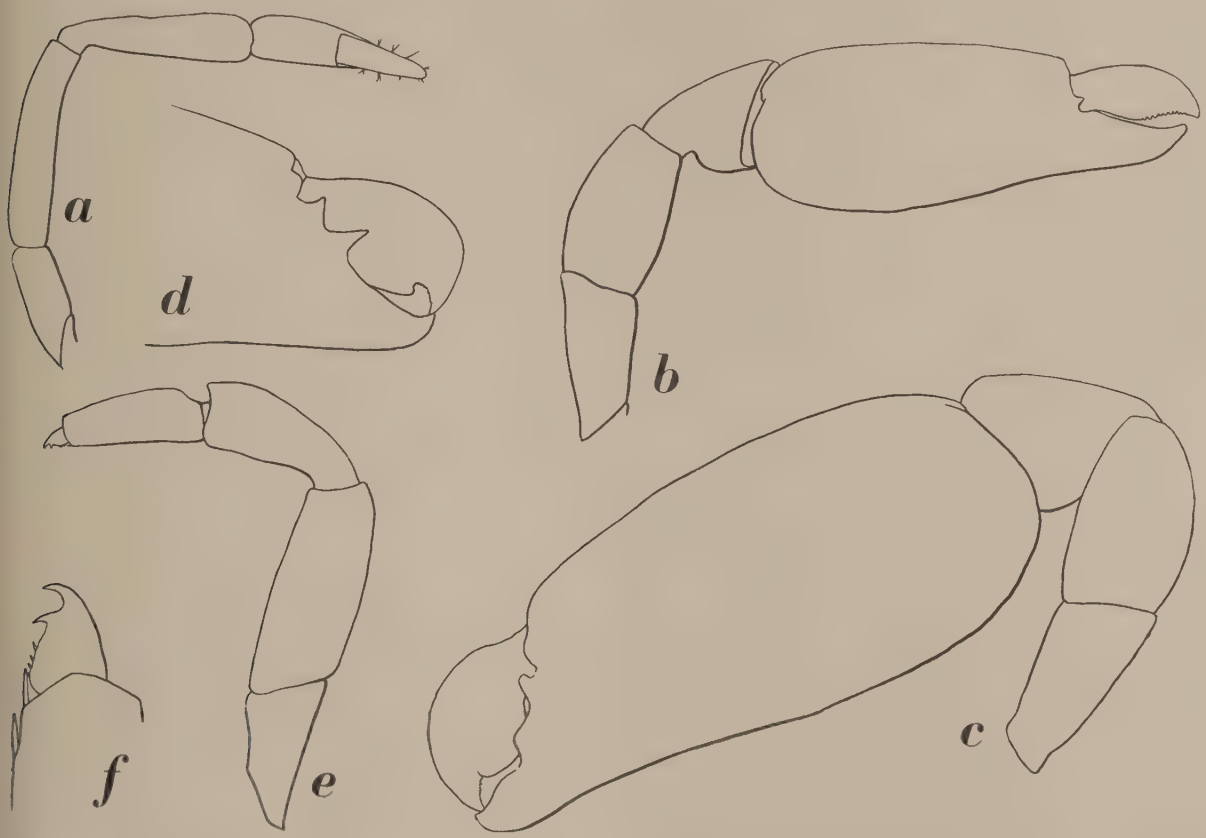


Fig. 62. *Periclimenaeus spongicola* nov. spec. a, first pereiopod; b, smaller second pereiopod; c, larger second pereiopod, external view; d, distal part of larger second pereiopod, internal view; e, third pereiopod; f, dactylus of third pereiopod. a-e, × 25; f, × 120.

penultimate. The antepenultimate segment is about twice as long as the ultimate, its inner margin is concave. The exopod reaches far beyond the end of the antepenultimate joint.

The first pereiopod (fig. 62a) reaches with half the merus beyond the scaphocerite. The fingers are slender, they are about as long as the palm and are provided with small tufts of setae. The carpus is somewhat longer than the chela and is about as long as the merus, it is broadened

anteriorly. The ischium is about half as long as the merus. The second pereiopods (figs. 62b-d) are very unequal in shape and size, they reach with the chela and part of or with the entire carpus beyond the scaphocerite, the surface of both chelae is smooth. The larger leg has the palm swollen, about four times as long as the fingers and somewhat less than twice as long as high; the fingers are short and blunt, with curved tips. The dactylus is strong and thickset, its dorsal margin is strongly convex and is compressed anteriorly to a blunt dorsal ridge, at the base of this ridge the upper surface shows a shallow excavation; the cutting edge of the dactylus possesses a large hammer-shaped tooth, which fits in a socket in the fixed finger; anteriorly of this hammer-shaped tooth the cutting edge of the dactylus is serrate. The outer surface of the dactylus is convex, the inner concave. The socket in the fixed finger, in which fits the hammer-shaped tooth of the dactylus, is flanked at its inner side by a strong and sharply pointed tooth and at the outside by a low blunt tooth. The carpus is short and triangular, being narrowest at base and rapidly broadening distally, it is about $^1/_3$ as long as the chela. The merus is distinctly longer and narrower than the carpus. The ischium is about as long as the merus. All joints are unarmed. The other second pereiopod is shorter and more slender than the stronger leg. The fingers are somewhat less than half as long as the palm, they are slenderer and more compressed than in the larger leg. The dactylus is slightly longer than the fixed finger and its cutting edge is provided with a row of numerous small teeth, the cutting edge of the fixed finger bears one blunt tooth near its base. The carpus measures $^1/_3$ of the length of the palm and is broadened anteriorly. The merus is longer than the carpus and about as long as the ischium. All joints are unarmed. The last three pereiopods are rather robust, they are similar in shape. The third pereiopod (fig. 62e) has the dactylus (fig. 62f) distinctly biunguiculate, its basal part is slightly swollen and bears there some movable spines; the dactylus is much narrower than the distal end of the propodus. The propodus is about four times as long as the dactylus, it is about $2^1/_2$ times as long as broad, the greatest width lies in the proximal part, it narrows distally; some spines are present in the distal part of the posterior margin of the propodus. The carpus is about as long as the propodus, it narrows proximally. The merus is about $1^1/_2$ times as long as the propodus and is distinctly broader than that joint. The ischium is about half as long as the merus.

The endopod of the uropod is somewhat longer than the telson, the exopod is slightly shorter. The outer margin of the exopod is slightly convex and naked, it ends in a strong tooth, which is more or less directed outwards and which is provided at its inner side with a slender movable spine.

The present species is closely related to *P. tridentatus,* from which it may be distinguished at once by the shape of the rostrum and of the last three pereiopods. Also the biology of the two species is quite different, *P. tridentatus* namely is associated with Ascidia, while *P. spongicola* lives in sponges. The present specimen of the new species was found in a narrow channel of a sponge and was closely surrounded by the sponge tissue, only the tips of the fingers being visible from the outside. No male specimen was found in the sponge.

Periclimenaeus tridentatus (Miers) (figs. 63-65)

Coralliocaris ? tridentatus Miers, 1884, Rep. zool. Coll. Alert, p. 294, pl. 32 fig. C.
(*?*) *Coralliocaris tridentata* Borradaile, 1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 386.
Coralliocaris hecate Nobili, 1904, Bull. Mus. Hist. nat. Paris, vol. 10, p. 232.
Coralliocaris hecate Nobili,1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 58, pl. 3 fig. 2.

Coralliocaris quadridentata Rathbun, 1906, Bull. U.S. Fish Comm., vol. 23 pt. 3, p. 920, textfig. 69, pl. 24 fig. 1.
"Zwei mässig grosse Makruren" Sluiter, 1909, Siboga Exped., mon. 56b, p. 86.
Coralliocaris hecate Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 385.
Coralliocaris rathbuni Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 385.
Coralliocaris (*Onycocaris*) *tridentata* Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool. ser. 2 vol. 17, p. 386.
? Coralliocaris hecate Balss, 1921, K. Svenska Vetensk. Akad. Handl., vol. 61 pt. 10, p. 14.
Coralliocaris tridentata Edmondson, 1923, Bull. Bishop Mus. Honolulu, n. 5, p. 34.
Coralliocaris tridentata Edmondson, 1924, Proc. Pan Pacif. Sci. Congr. Austr., vol. 2, p. 1551.
Coralliocaris tridentata Edmondson, 1925, Bull. Bishop Mus. Honolulu, n. 27, p. 7.
Coralliocaris quadridentata Edmondson, 1925, Bull. Bishop Mus. Honolulu, n. 27, p. 7.
Periclimenes (*Ancylocaris*) *crassipes* Calman, 1939, Sci. Rep. John Murray Exped., vol. 6, p. 211, fig. 5.
Coralliocaris tridentata Edmondson, 1946, Spec. Publ. Bishop Mus. Honolulu, vol. 22, p. 249, fig. 150a.
Coralliocaris quadridentata Edmondson, 1946, Spec. Publ. Bishop Mus. Honolulu, vol. 22, p. 249, fig. 150b.

Siboga Expedition

Station 40, anchorage off Kawasang Island, Paternoster Group; townet and shore exploration; depth 12 m; bottom coralreef; April 2, 1899. — 1 specimen 10 mm.
Station 64, Kambangragi Bay, Djampea; trawl, dredge and shore exploration; depth up to 32 m; bottom coral and coral sand; specimens found in the larger cavities in the testa below the cloacal aperture of *Lissoclinum molle* (Herdm.) (= *Diplosomoides molle* Herdm.); May 4 and 5, 1899. — 2 specimens (one ovigerous female) 14 and 15 mm.
Station 99, anchorage off North Ubian, Sulu Archipelago, 6° 7′.5 N, 120° 26′ E; dredge, townet; depth 16-23 m; Lithothamnion bottom; specimens in Ascidians; June 28-30, 1899. — 3 specimens (one of which an ovigerous female) 13-21 mm.
Station 310, Sape Bay, E. Sumbawa, 8° 30′ S, 119° 7′.5 E; dredge; depth 73 m; bottom sand with few pieces of dead coral; February 12, 1900. — 2 specimens (one of which an ovigerous female) 11 and 14 mm.

The rostrum is slender, more or less directed downward, the extreme tip is curved upwards, it reaches the middle of the second segment of the antennular peduncle. The upper margin bears three or four teeth, all of which are placed on the rostrum before the posterior margin of the orbit. The lower margin of the rostrum is convex, without teeth. The carapace is swollen and provided with a strong postorbital ridge, which sometimes is produced in its lower part, forming thereby a blunt supraorbital knob. The antennal spine is strong and placed slightly below, or almost on the lower angle of the orbit. The anterolateral angle of the carapace is rounded and produced forwards.

The abdomen is smooth. The pleurae of the first four segments are broadly rounded, that of the fifth segment is narrower, the tip is almost rectangularly rounded. The pleura of the sixth segment as well as the posterolateral angle of that segment are pointed, sometimes, however, the latter is rounded. The sixth segment is about as long as the fifth.

The telson (fig. 63c) is twice as long as the sixth abdominal segment and is slightly less than twice as long as broad. The two dorsal pairs of spines are placed close to the lateral margins, the posterior pair is placed closer to the margins than the anterior pair. The two pairs of spines are placed so as to divide the telson in three about equal parts. The dorsal surface of the telson is rather flat and

bears an inconspicuous median groove. Three pairs of spines are placed on the posterior margin of the telson. The outer pair is shortest, the intermediate longest, while the submedian pair is slightly shorter than the intermediate.

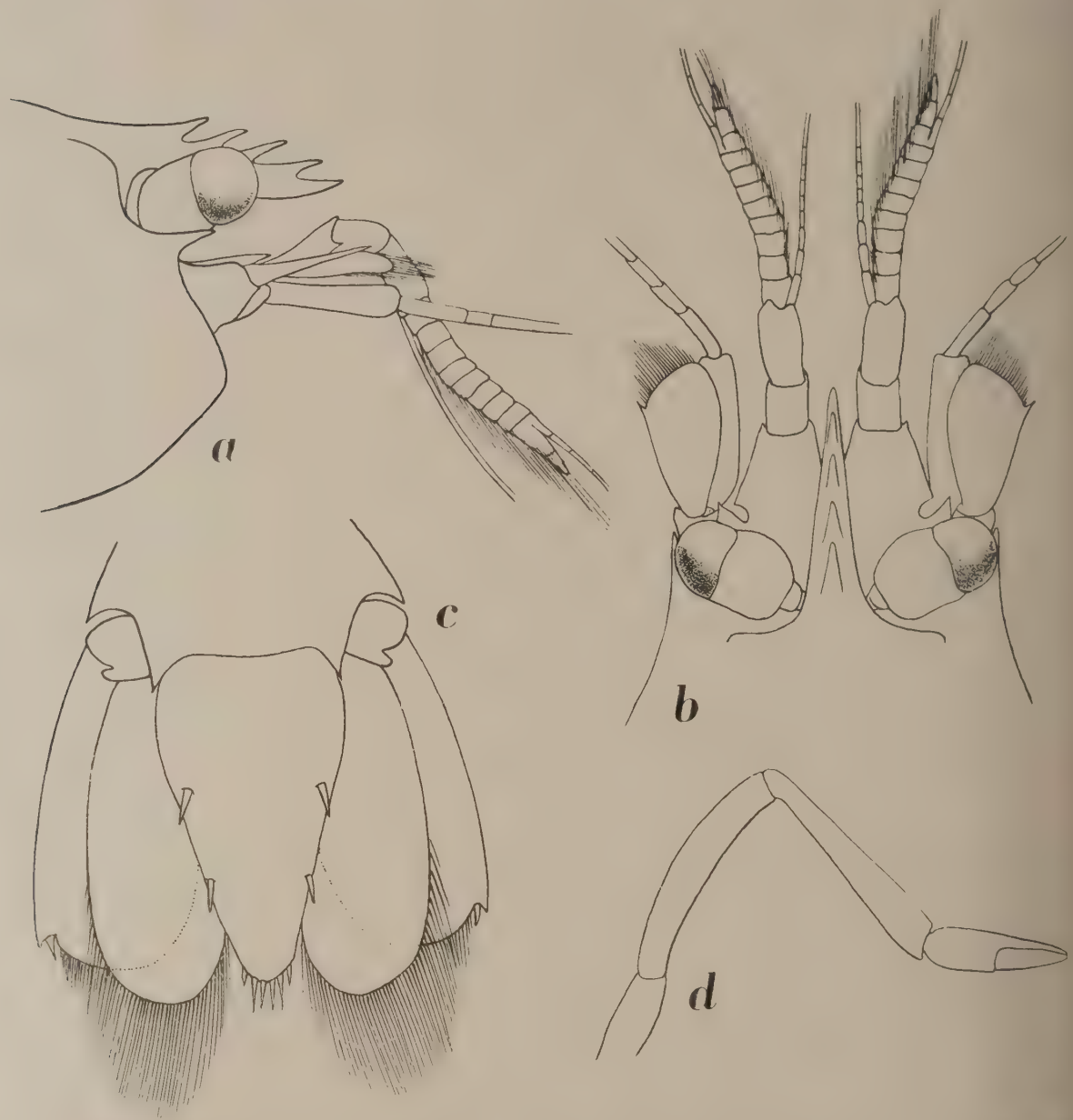


Fig. 63. *Periclimenaeus tridentatus* (Miers). a, anterior part of body, lateral view; b, anterior part of body, dorsal view; c, telson and uropods, dorsal view; d, first pereiopod. a-d, × 18 (after a specimen from Siboga Sta. 99).

The eyes are well developed. The cornea is slightly broader or slightly narrower than the eyestalk. The eyes reach beyond the middle of the rostrum, but fail to reach the tip of it.

The antennular peduncle has the first segment provided with a broad stylocerite, which abruptly ends in a sharp point; this stylocerite is directed obliquely outwards. Immediately above the

stylocerite the lateral margin of the basal segment is produced triangularly. The anterolateral spine of the basal segment is very small. The second segment is as broad as and slightly shorter than the third. Together these two segments are more than half as long as the first. The upper antennular flagellum has the two rami fused for 6 to 9 joints; the free part of the shorter ramus consists of about 2 joints and measures about $^1/_5$ to $^1/_{10}$ of the length of the fused portion.

The scaphocerite is short and reaches only slightly beyond the tip of the rostrum, it reaches to or almost to the end of the second segment of the antennular peduncle. The outer margin is straight and ends in a distinct tooth, which is slightly outreached by the lamella. The greatest width of the lamella lies in the anterior part of it. The last joint of the antennal peduncle is long and reaches distinctly beyond the scaphocerite.

The incisor process of the mandible (fig. 64a) ends in two teeth; on the molar process spines are present. The maxillula (fig. 64b) has the upper lacinia rather broad, the palp is indistinctly

Fig. 64. *Periclimenaeus tridentatus* (Miers). a, mandible; b, maxillula; c, maxilla. a, b, × 60; c, × 25.

bilobed. The maxilla (fig. 64c) has the inner lacinia not cleft. The first two maxillipeds are typical. The third maxilliped reaches about to the end of the first segment of the antennular peduncle. The ultimate segment is slightly more than $^2/_3$ as long as the penultimate. The antepenultimate segment is about twice as long as the ultimate, its inner margin is concave. The exopod reaches far beyond the end of the antepenultimate segment.

The first pereiopod (fig. 63d) reaches with more than the chela and the carpus beyond the scaphocerite. The fingers are slender, provided with tufts of setae, they are about as long as or longer than the palm. The carpus is slightly more than 1.5 times as long as the chela. The merus is about as long as the carpus. The ischium is relatively short. The second pereiopods (figs. 65a-f) are very unequal in shape and size. In all four specimens in which both chelae are present the right leg is the larger, reaching with the propodus and the carpus beyond the scaphocerite. The surface of the chela is smooth or tuberculate; the number and strength of the tubercles, when these are present, is very variable. The fingers are about half as long as the palm, sometimes they are shorter, being almost $^1/_3$ of the length of the palm. The dactylus is thickset with the upper margin strongly convex, rounded in the proximal part and compressed in the distal portion to a blunt dorsal ridge. The outer surface

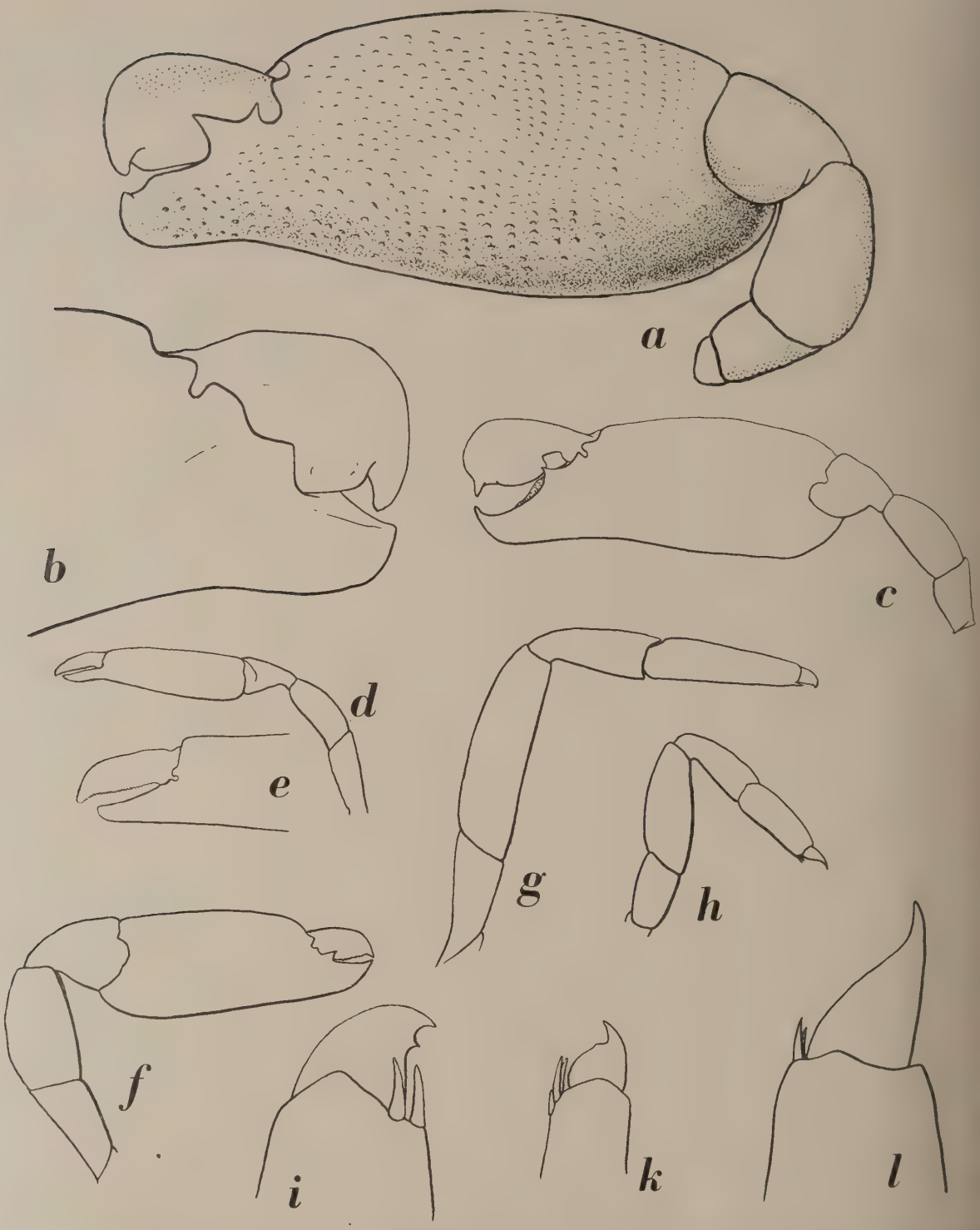


Fig. 65. *Perichimenaeus tridentatus* (Miers). a, larger second pereiopod, internal view; b, distal part of larger second pereiopod, external view; c, larger second pereiopod, internal view; d, smaller second pereiopod; e, distal part of smaller second pereiopod; f, smaller second pereiopod; g, h, third pereiopod; i, k, l, dactylus of third pereiopod. (a, b, f, h, k, after a specimen from Siboga Sta. 64, the rest after specimens from Siboga Sta. 99.) a, e-h, × 12; b, × 14; c, d, × 6; i-k, × 86.

of the dactylus is smooth, convex, the inner surface more or less concave. The cutting edge bears one very strong truncate tooth, which fits in a pit in the cutting edge of the fixed finger; near the tip the cutting edge of the dactylus often is provided with minute teeth. The fixed finger is provided dorsally with the pit mentioned above; this pit is flanked externally by one small blunt tooth, internally by a strong and sharply pointed tooth near the base. The dactylus shows an excavation on the dorsal surface near the articulation with the propodus. The palm is swollen and about half as broad as long, it is rounded below. The carpus is very short, triangular and much narrower than the palm, it measures about 1/3 of the length of the palm. The merus is somewhat longer than the carpus, it is rather broad and unarmed. The ischium is slightly shorter than the merus. The left pereiopod is much shorter than the right, it reaches with the chela and part of or with the entire carpus beyond the scaphocerite. The fingers are less than half as long as the palm; here, like in the larger leg, there is a considerable variation in the relation between the lengths of the fingers and that of the palm. The dactylus sometimes is distinctly longer than the fixed finger. The cutting edge of the dactylus is crenulate almost throughout its entire length. The cutting edge of the fixed finger is provided with one small tooth in the proximal part. The fingers and the palm are less swollen and are more compressed than in the right leg. The carpus measures about 1/3 of the length of the palm, it is broader anteriorly than posteriorly and is unarmed. The merus is longer than, while the ischium is as long as the carpus, both are unarmed. The third pereiopod (figs. 65g, h) reaches with the dactylus and a large part of the propodus beyond the scaphocerite. The dactylus (figs. 65i-l) does not bear a basal tubercle, though the basal part sometimes is somewhat swollen; as already pointed out above, the proximal ventral angle of the dactylus may become visible and may give the impression of a basal tubercle, when the dactylus is curved far forwards. The lower margin of the dactylus bears a small spine close to the apex, this accessory spine often is very small and even may be entirely wanting (in Calman's *Periclimenes crassipes* this spine too is hardly indicated). The propodus is about 4 to 8 times as long as the dactylus and is slightly more than twice to thrice as long as broad, it is broadest proximally becoming narrower distally; in the distal part of the posterior margin it is provided with some setae and some spinules. The carpus is about 3/4 of the length of the propodus. The merus is distinctly longer than the propodus. The ischium is about half as long as the merus. The fourth and fifth pereiopods are similarly built as the third, but are more slender.

The endopod of the uropods is slightly longer than the telson, the exopod is slightly shorter. The outer margin of the exopod is convex, naked and ends into two spines, the inner of which is movable.

I refer the present specimens to Mier's species because they agree with Mier's description in almost all points. The statement of the English author that the palm of the second pereiopod in the type specimen of the present species "appears to have been carinated" in all probability is due to the fact that that organ "is much shrivelled". Mier's specimen only was provided with one of the second legs. The statement in the description that this leg had the fingers without teeth makes it almost certain that the smaller leg was present, while the larger was lacking.

Nobili's (1906b) description and figures of *Coralliocaris hecate* in all important points agree with the present species. The only differences I could find are:

1. The eyes are figured much more slender than they are in my specimens. In his description Nobili stated: "Les yeux sont cylindriques et les pédoncles sont plutôt longs."

2. According to Nobili's figure the second pereiopods reach farther forward than in my specimens, nothing is mentioned about this feature in the description.

3. Nothing is stated by Nobili about the pectination of the dactylus of the lesser second pereiopod, this feature is not shown in the figure. It is possible however, that it escaped the notice of the Italian author.

4. The carpus of the lesser second pereiopod is figured longer by Nobili than it is in my specimens.

All these differences are shown in Nobili's figure and are not or not clearly stated in the text. They may therefore be due to a certain incorrectness of the figure, the more as it is a well known fact that Nobili often exaggerated some features in his figures (vid. for instance Kemp, 1922, p. 186). I therefore regard the species of Nobili to be identical with that of Miers, till a final decision can be made by the examination of the type specimens.

Coralliocaris quadridentata Rathbun, later incorrectly renamed *C. rathbuni* by Borradaile (1917a), who thought that the name *quadridentata* was preoccupied, also must be considered a synonym of *Periclimenaeus tridentatus*. During a stay at the U.S. National Museum I was able, through the kindness of Dr. Fenner A. Chace Jr., to examine Rathbun's type specimen. This examination showed the specimen to belong to the present species. Rathbun (1906) herself already pointed to the close resemblance of her species and *Coralliocaris tridentata* Miers. The differences mentioned by her, however, partly are due to the fact that the chela in Mier's specimen was in a poor condition and probably was the smaller of the two chelae of the first pair; furthermore the length of the eye, a character to which Miss Rathbun attached much value, is of hardly any importance for the distinction of two species in this genus.

The species for a fourth time is reported as new, namely by Calman (1939) under the name *Periclimenes* (*Ancylocaris*) *crassipes*. Calman's beautiful figure and his description at once show that his species is identical with the present form. Calman placed the species in the subgenus *Ancylocaris* and not in *Periclimenaeus* because no accessory tooth was present at the dactylus of the last three pereiopods. As already pointed out above this character is very variable in the genus *Periclimenaeus* and even within the present species.

Vertical distribution. The species is recorded from depths varying between 7 and 77 m. Calman stated that his specimens were "pulled off calcareous sponges or removed from the debris in the jar containing them." The specimens from Siboga Sta. 64 and 99 were associated with Ascidians: the specimens from Sta. 64 were found in the larger cavities in the testa below the cloacal aperture of *Lissoclinum molle* (Herdm.), an Ascidian that has been mentioned by Sluiter (1909, p. 85) under the name *Diplosomoides molle* Herdm.

Horizontal distribution. The records in literature are: Jibuti, Red Sea (Nobili, 1904, 1906b), South Arabian coast, 18° 03'.5 N, 57° 02'.5 E (Calman, 1939), Cape Jaubert, N.W. Australia (Balss, 1921), Thursday Island, Torres Straits (Miers, 1884), Palmyra Island (Edmondson, 1923, 1924), Johnston Island (Edmondson, 1925), Pearl and Hermes Reef, Hawaiian Archipelago (Edmondson, 1925), Auau Channel between Maui and Molokai, Hawaiian Archipelago (Rathbun, 1906), Hawaii (Edmondson, 1946). The species now for the first time is recorded from the Malay Archipelago.

Onycocaris Nobili, 1904

In 1904 Nobili erected a new subgenus *Onycocaris* of the genus *Coralliocaris*; he included two species in this subgenus, namely *Coralliocaris* (*Onycocaris*) *aualitica* and *Coralliocaris* (*Onycocaris*) *rhodope*, which both were described as new, the former of these species is selected here as the type of *Onycocaris*, as it is mentioned first in Nobili's paper. In the material at my disposal the species mentioned by Nobili as *Coralliocaris* (*O.*) *rhodope* is represented, while another species in the collections at hand shows to be closely related to *Coralliocaris* (*O.*) *aualitica*. Comparison of these two species and Nobili's descriptions, with the other Pontoniid material made it clear that *Coralliocaris rhodope* differs so much from the other two species, that it can not be maintained in the same genus; furthermore *Onycocaris* must be considered a separate genus distinct from *Coralliocaris*. Kemp (1922) when studying Nobili's descriptions already pointed to the possibility of these two conclusions. The genus *Onycocaris* at present contains three species, viz., the type species *O. aualitica*, the new *O. stenolepis*, and the species described by Balss (1921) as *Pontonia quadratophthalma*. *Coralliocaris* (*Onycocaris*) *rhodope* Nobili has to be removed to the genus *Periclimenaeus*. That *Onycocaris* can not be fused with *Coralliocaris* is clearly shown by the fact that the dactylus, though it sometimes is slightly swollen in the basal part, never possesses a distinct basal protuberance as in *Coralliocaris* and the related genera. *Onycocaris* shows most resemblance to *Periclimenaeus*, but may be distinguished at once by the very short unarmed rostrum and the high chelae of the second legs, the left and right of which are equal in shape, and have the fingers slender.

Key to the species of *Onycocaris*

1. Scaphocerite without final tooth. Margin of uropods denticulate. . . . . *aualitica*
— Scaphocerite with a distinct final tooth. No denticles on the margins of the uropods 2
2. Scaphocerite very narrow and elongate. First pereiopods not very slender, fingers about as long as the palm . . . . . *stenolepis*
— Scaphocerite moderately broad. First pereiopods extremely slender, palm being more than thrice as long as the fingers . . . . . *quadratophthalma*

Onycocaris aualitica (Nobili, 1904)

Coralliocaris (*Onycocaris*) *aualitica* Nobili, 1904, Bull. Mus. Hist. nat. Paris, vol. 10, p. 233.
Coralliocaris (*Onycocaris*) *aualitica* Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 60, pl. 3 fig. 3.
Coralliocaris (*Onycocaris*) *aualitica* Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 385.
Onycocaris aualitica Kemp, 1922, Rec. Indian Mus., vol. 24, p. 278.

The present species, the type of the genus *Onycocaris*, is known only from the two specimens recorded by Nobili from Jibuti. Its differences with the other species have already been pointed out above.

It is not known whether the species is associated with other animals.

Onycocaris stenolepis nov. spec. (figs. 66-68)

Siboga Expedition

Station 96, southeast side of Pearl Bank, Sulu Archipelago; dredge, townet; depth 15 m; bottom lithothamnion; June 27, 1899. — 1 ovigerous female 11 mm.

The rostrum is very short, it fails to reach the end of the ophthalmic peduncle; it ends in a rather acute point, when seen from above; the tip is truncate in lateral view. No teeth are present on the rostrum. The carapace is smooth and provided with a strong antennal spine only. Behind the orbit a postorbital ridge is present. The anterolateral angle of the carapace is rounded, and somewhat produced anteriorly.

The abdomen is smooth, the first five segments have the pleurae broadly rounded, that of the

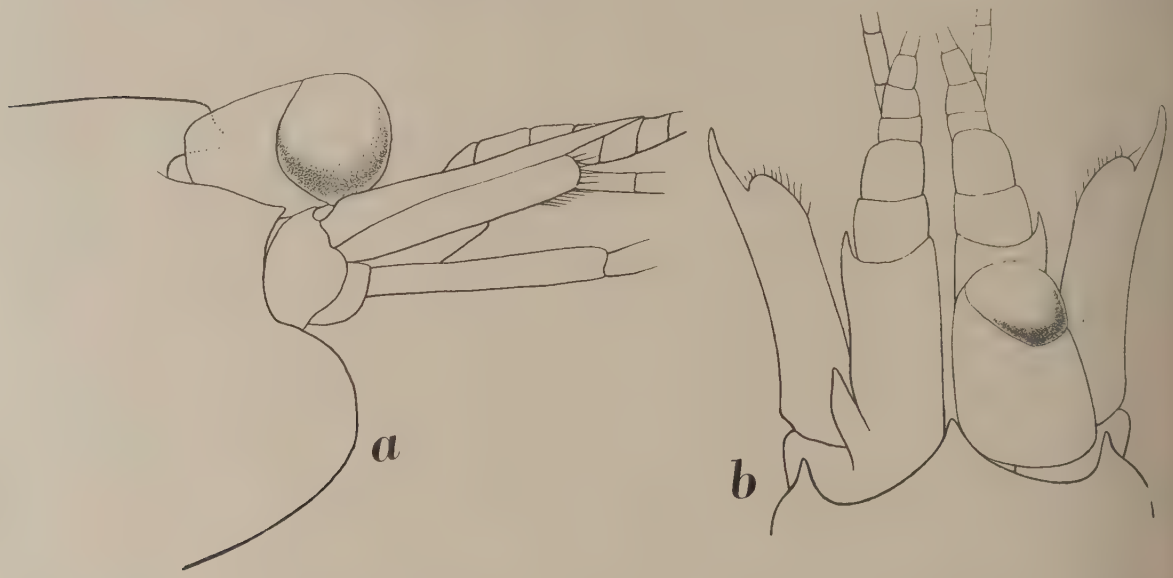


Fig. 66. *Onycocaris stenolepis* nov. spec. a, anterior part of body, lateral view; b, anterior part of body, dorsal view. a, b, × 60.

sixth segment is bluntly pointed, the posterolateral angle of the sixth segment is pointed. The sixth segment is as long as the fifth.

The telson (fig. 67a) is almost twice as long as the sixth abdominal segment and about half as broad as long. The dorsal surface bears two pairs of strong spines. The first pair is situated in the anterior quarter of the telson, the second pair is placed slightly nearer to the first pair than to the posterior margin of the telson. This posterior margin is provided with four pairs of spinules. The outer pair is shortest, the following longest and the two inner pairs which are of equal length are slightly shorter than the intermediate pair. Perhaps the presence of a second submedian pair is an abnormality only.

The eyes fail to reach the end of the basal segment of the antennular peduncle. The cornea is much shorter and slightly narrower than the stalk.

The basal segment of the antennular peduncle is broad; the stylocerite is pointed, it is directed forwards and slightly outwards and almost reaches the middle of the basal segment. The anterolateral angle of the basal segment is strongly pointed and reaches distinctly beyond the middle of

the second segment of the antennular peduncle. The second and third segment of the antennular peduncle are subequal; together they are slightly more than half as long as the first segment. The two flagella are broken in my specimen.

The scaphocerite (fig. 67b) reaches beyond the antennular peduncle. The lamella is narrow, over its entire length it is about of the same breadth. The outer margin of the scaphocerite is concave and ends in a strong spine, which reaches with almost its entire length beyond the lamella. The last

Fig. 67. *Onycocaris stenolepis* nov. spec. a, telson and uropods, dorsal view; b, scaphocerite; c, mandible; d, maxilla. a, × 30; b, d, × 75; c, × 150.

segment of the antennal peduncle is long and reaches the end of the lamella. There is no spine at the basal part of the antennal peduncle.

The incisor process of the mandible (fig. 67c) ends in two teeth, between which a minute third tooth is visible. The molar process narrows towards the apex, no spines could be observed there. The maxilla (fig. 67d) has the inner lacinia uncleft. The first two maxillipeds are typical. The third maxilliped reaches the end of the first segment of the antennular peduncle. The ultimate segment is shorter than the penultimate. The antepenultimate segment is longest. The exopod reaches beyond the antepenultimate segment.

The first pereiopod (fig. 68) is long, it reaches with the larger part of the merus beyond the scaphocerite. The fingers are distinctly longer than the palm and are provided along the outer margin of their cutting edges with slender spinules, which are placed alternatingly when the chela is closed. The carpus is as long as the chela, it narrows posteriorly. The merus is distinctly longer than the carpus. The ischium is about half as long as the merus. Of the second pereiopods (fig. 68b) only one is present. It reaches with the carpus and the chela beyond the scaphocerite. The fingers are half as long as the palm, the tips are crossing. The dactylus is provided with one ventral, the fixed finger with two dorsal teeth; these teeth all are rather weak and are placed in the proximal half of the fingers. The palm is smooth and high, being about twice as long as its largest height. The carpus is much narrower than the palm and slightly less than half as long as it; it is broadest anteriorly and narrows

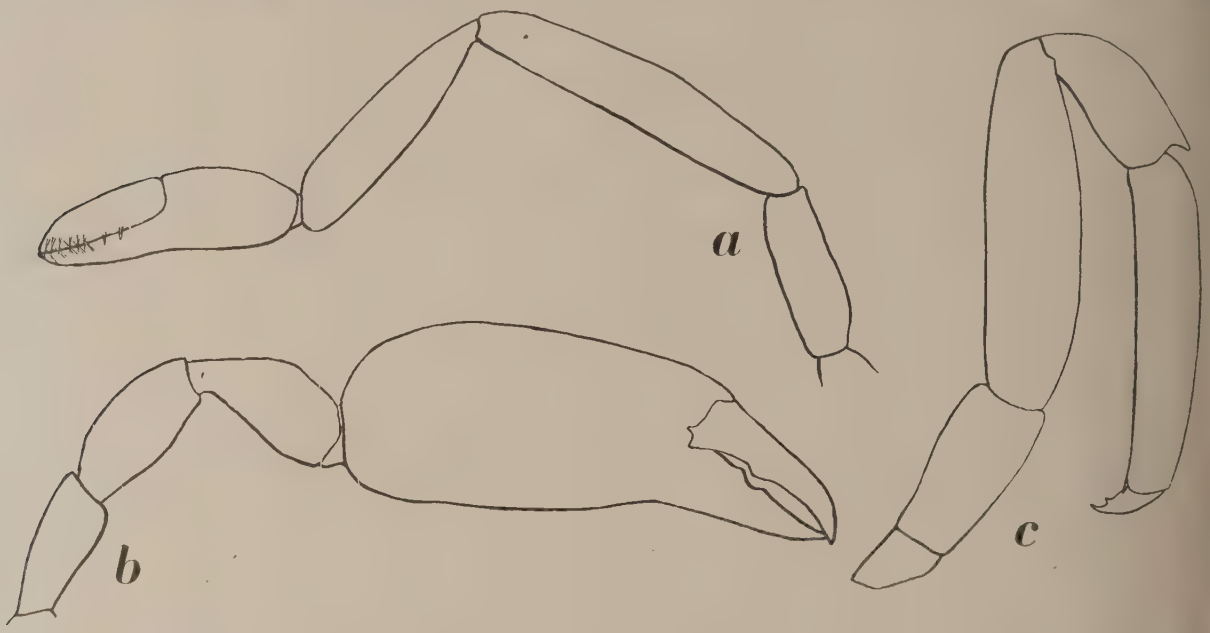


Fig. 68. *Onycocaris stenolepis* nov. spec. a, first pereiopod; b, second pereiopod; c, third pereiopod. a-c, × 50.

posteriorly, it bears no spines. The merus is about as long as the carpus and is slightly swollen. The ischium is compressed and about as long as the merus, it bears a blunt anteroventral tooth. The merus is unarmed. The last three pereiopods are robust (fig. 68c). The dactylus ends into two claws and is rather broad. The propodus is four times as long as the dactylus and about five times as long as broad; near the distal extremity the posterior margin is provided with a movable spine. The carpus is half as long as the propodus. The merus is about as long as the propodus and twice as long as the ischium, it bears no spines.

The uropods are longer than the telson. The exopod has the outer margin convex and ending into two spines.

Onycocaris quadratophthalma (Balss)

Pontonia quadratophthalma Balss, 1921, K. Svenska Vetensk. Akad. Handl., vol. 61 pt. 10, p. 15. fig. 7.

Pontonia quadratophthalma Kemp, 1922, Rec. Indian Mus., vol. 24, p. 261.

Pontonia quadratophthalma Edmondson, 1925, Bull. Bishop Mus. Honolulu, vol. 27, p. 7.
Pontonia quadratophthalma Edmondson, 1946, Spec. Publ. Bishop Mus. Honolulu, vol. 22, p. 250, fig. 150c.

In the U.S. National Museum I could examine several specimens of this species from the Hawaiian Islands (Kahala, Oahu, May, 1931, C. H. Edmondson, U.S.N.M. reg. no. 67558, 3 specimens; Hawaiian Islands, C. H. Edmondson, U.S.N.M. reg. no. 63858, 2 specimens). They agree well with the description and figure given by Balss (1921) of *Pontonia quadratophthalma.* The species, however, proved not to belong to the genus *Pontonia,* but showed to be a species of *Onycocaris.* The differences with the two other species of this genus have already been given in the key.

Vertical distribution. The species is a litoral form. The above mentioned specimens from Oahu were found in a sponge.

Horizontal distribution. The species is known from N.W. Australia and Oceania. The records in literature are: Cape Jaubert, N.W. Australia (Balss, 1921), Wake Island (Edmondson, 1925), Pearl and Hermes Reef (Edmondson, 1925), Hawaii (Edmondson, 1946).

Philarius nov. gen. [1]).

Definition: Pontoniid prawns living epizootic on Madreporaria. Body rather clumsy, not depressed. Rostrum distinct, compressed, provided with teeth. Carapace smooth, provided with antennal spines only, hepatic spine absent. Postorbital ridge present.

Abdomen smooth. Pleurae of first five segments broadly rounded or ending in an obtuse angle. Sixth segment short.

Telson elongate triangular. Dorsal surface with 2 pairs of spines. Posterior margin with three pairs of spines.

Eyes well developed, with hemispherical cornea.

Basal segment of antennular peduncle broad, with lance-shaped stylocerite, and with a small spine at the lower part of the inner margin. Last two segments short. Upper antennular flagellum ending in two rami.

Scaphocerite narrow. Final tooth strong. Antennal peduncle with an external spine.

Mandible without palp; incisor process ending in three teeth, molar process with blunt knobs and ridges and brushlike arranged spines. Palp of maxillula with an indistinct upper lobe, inner lacinia slender. Maxilla with inner lacinia simple, scaphognathite rather broad. First maxilliped with the palp rather short; basis and coxa distinctly separated. Second maxilliped normal in shape, podobranch absent. Third maxilliped slender, without arthrobranch. All maxillipeds with exopods.

First pereiopods slender. Second pereiopods equal or subequal in shape; palm cylindrical, not much swollen; fingers slender, provided at the cutting edges with rather small teeth. Last three pereiopods rather short and broad, dactylus simple, strongly curved.

Uropods elongate.

Type species: *Harpilius Gerlachei* Nobili.

The two species of the present genus formerly were inserted in the genus *Harpilius,* which

1) *Philarius,* anagram of *Harpilius.*

here is considered a subgenus of *Periclimenes*. *Philarius* differs from *Harpilius* by the absence of the hepatic spine and by the absence of an arthrobranch at the base of the third maxilliped.

Philarius gerlachei (Nobili) (Fig. 69)

Harpilius Gerlachei Nobili, 1905, Bull. Mus. Hist. nat. Paris, vol. 11, p. 160.
Harpilius Gerlachei Nobili, 1906, Bull. sci. France Belg., vol. 40, p. 45, pl. 4 fig. 10.
Harpilius Gerlachei Balss, 1915, Denkschr. Akad. Wiss. Wien, vol. 91 suppl., p. 27.
Harpilius gerlachei Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 381.
Harpilius gerlachei Tattersall, 1921, Journ. Linn. Soc. Lond. Zool., vol. 34, p. 390, pl. 28 fig. 9.
Harpilius gerlachei Kemp, 1922, Rec. Indian Mus., vol. 24, p. 238, figs. 74, 75.
Harpilius gerlachei Ramadan, 1936, Bull. Fac. Sci. Egypt. Univ., vol. 6, p. 22.
Harpilius gerlachei Gurney, 1938, Sci. Rep. Great Barrier Reef Exped., vol. 6, pp. 19, 28, figs. 75-80, 123c [1]).
Harpilius gerlachei Armstrong, 1941, Amer. Mus. Novit., n. 1137, p. 12.

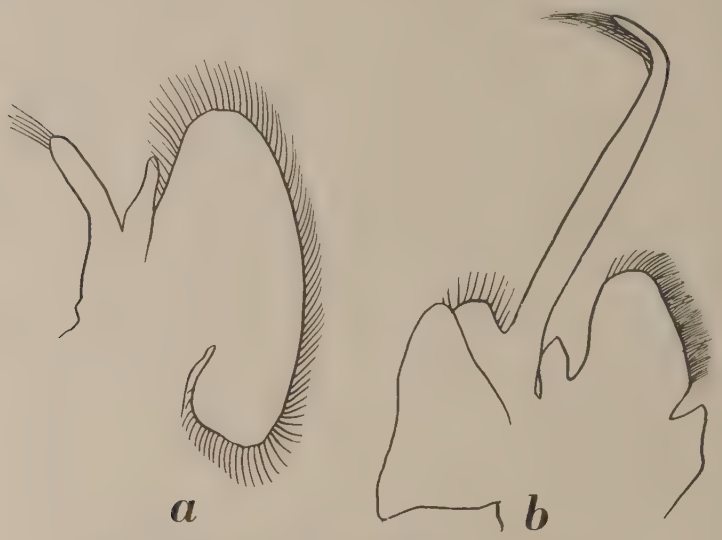


Fig. 69. *Philarius gerlachei* (Nobili). a, maxilla; b, first maxilliped. a, b, × 35.

Siboga Expedition

Station 79b, Kabala dua Island, Borneo Bank; reef; depth 22 m; June 12 and 13, 1899. — 1 ovigerous female 16 mm.
Station 91, Muaras Reef, inner side, east coast of Borneo; trawl and dredge; depth up to 54 m; bottom hard coral sand, coral at anchorage; June 22, 1899. — 1 ovigerous female 17 mm.

Snellius Expedition

Sissie near Misool; shore and reef; October 6, 1929. — 1 ovigerous female 15 mm.

All three specimens differ from N o b i l i's (1906) and K e m p's (1922) description by having the first tooth of the upper margin of the rostrum situated on the carapace behind the orbit, while the second is placed just over the orbit. In the specimen from Sta. 79b the rostrum is damaged, the other two specimens have the rostral formula different from the specimens described by the two

above mentioned authors: in the Siboga specimen the formula is $\frac{2}{1}$, in the Snellius specimen $\frac{7}{3}$. In other respects I could find no more differences with Nobili's and Kemp's descriptions, it must be noted, however, that in the Snellius specimen and in that of Siboga Sta. 91 both second pereiopods are missing, so that they perhaps may belong to *Philarius imperialis* (Kubo).

Part of the oral parts are figured by Gurney[1]), part of them are given here (figs. 69a, b). In the generic diagnosis the characters of the oral parts are dealt with.

Distribution. The species, which according to Kemp is associated with Madreporaria, is recorded in literature from: Tor, Sinai Peninsula, Red Sea (Balss, 1915), Ghardaqa, Red Sea (Ramadan, 1936; Gurney, 1938), Nawibi [= ? Nuebe in Gulf of Aqaba], Ras Abu Somer, Dahab [= ? Dhaba], and El Qoseir (Balss, 1915), Khor Dongonab, Red Sea (Tattersall, 1921), Raveiya, Red Sea (Balss, 1915), N.E. of Arzana Island, Persian Gulf (Nobili, 1905, 1906), Pamban and Kilakarai, Gulf of Manaar (Kemp, 1922), Savaii, Samoa Islands (Armstrong, 1941).

Pontoniopsis Borradaile, 1915

The only species of this genus is represented in the collections studied by one specimen. The species was not yet recorded from the Malay Archipelago.

Pontoniopsis comanthi Borradaile (figs. 70, 71)

Pontoniopsis comanthi Borradaile, 1915, Ann. Mag. nat. Hist., ser. 8 vol. 15, p. 213.
Pontoniopsis comanthi Potts, 1915, Pap. Dept. mar. Biol. Carnegie Inst., vol. 8, p. 81, pl. 1 fig. 3.
Pontoniopsis sp. Potts, 1915a, Proc. Cambridge philos. Soc., vol. 18, pp. 59, 62.
Pontoniopsis comanthi Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 377, pl. 57 fig. 27.
Pontoniopsis comanthi Clark, 1921, Bull. U.S. Nat. Mus., vol. 82 pt. 2, p. 629, fig. 944.
Pontoniopsis comanthi Kemp, 1922, Rec. Indian Mus., vol. 24, p. 239.

Siboga Expedition

Station 33, Bay of Pidjot, Lombok; trawl, dredge and shore exploration; depth 9-22 m; bottom mud, coral and coralsand; March 24-26, 1899. — 1 ovigerous female 6 mm.

The rostrum is compressed and reaches about to the end of the second segment of the antennular peduncle; it is little more than twice as long as its basal breadth; when seen dorsally it is triangular and ends in an acute point. The basal part of the rostrum overlaps the ophthalmic peduncles. In the middle of the dorsal surface a low longitudinal carina is visible, at each side of which the rostrum shows a shallow excavation. The lower surface of the rostrum is provided with a rather high median longitudinal crest. Neither upper nor lower surface is provided with teeth. The carapace is smooth. Only the antennal spine is present, which lies somewhat below the lower orbital angle on the anterior margin of the carapace. The anterolateral angle of the carapace is rounded. From the lower part of the posterior margin of the orbit a groove runs obliquely upward and backward.

The abdomen is smooth. The pleurae of the first three segments are broadly rounded, those

1) In Gurney's figure 123 the numbers Cv and Dv are interchanged, Cv namely represents the first maxilliped of *"Harpilius" beaupresi*, Dv that of *"Harpilius" gerlachei*.

of the fourth and fifth segments are narrower, but end in a rounded angle. The sixth abdominal segment is 1.5 times as long as the fifth.

The telson (fig. 70c) is slightly longer than the sixth abdominal segment. Its dorsal surface is provided with 2 pairs of very small spinules. The anterior pair of these spinules lies slightly behind the middle of the telson, the other pair is situated midway between the anterior pair and the posterior

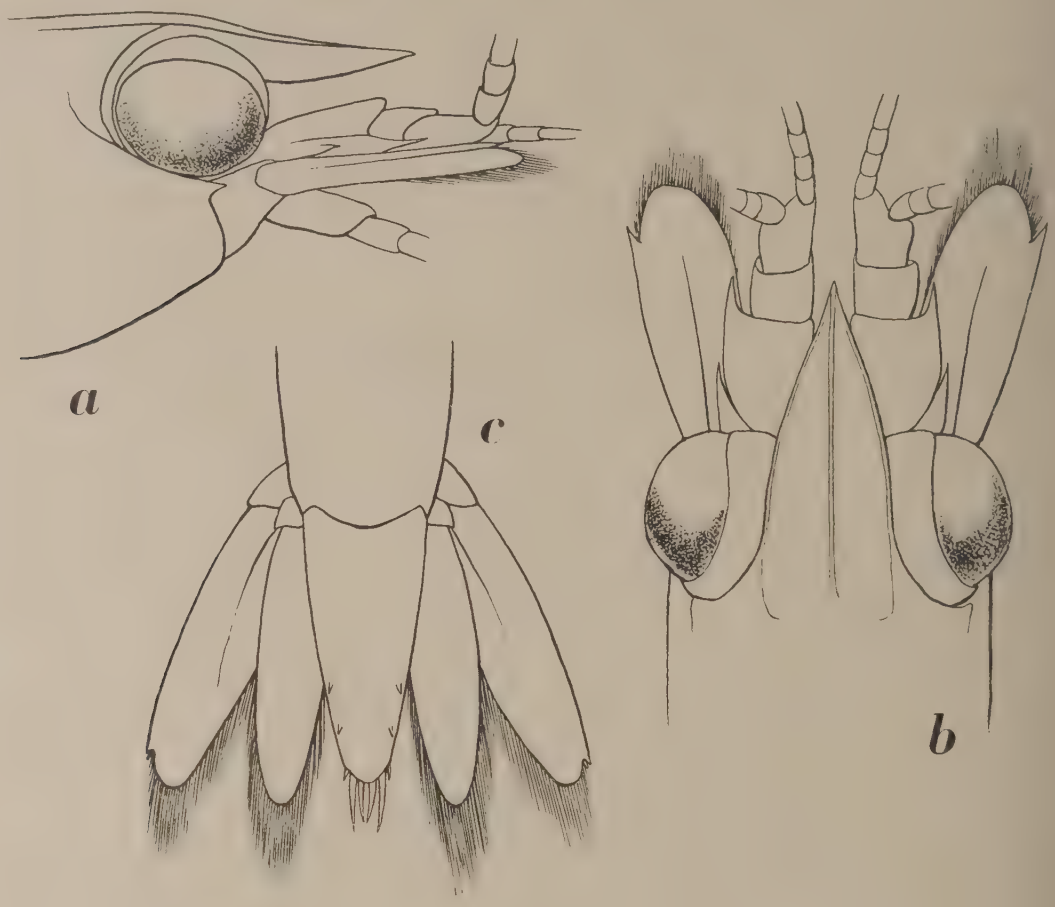


Fig. 70. *Pontoniopsis comanthi* Borr. a, anterior part of body, lateral view; b, anterior part of body, dorsal view; c, telson and uropods, dorsal view. a-c, × 50.

margin of the telson. This posterior margin bears three pairs of spines; the outer pair is very short, the intermediate is longest, the submedian pair is more than half as long as the intermediate.

The eyes are rounded, and broader than long. The cornea is shorter and narrower than the stalk.

The first segment of the antennular peduncle is broad and is provided with a well developed stylocerite, which reaches distinctly beyond the middle of the basal segment. The anterolateral spine of the basal segment is very strong and reaches almost the end of the second segment. The second segment is shorter than the third and both are narrower than the first. Together the second and third antennular segments are about as long as the visible part of the first segment. Both flagella are broken in my specimen.

The scaphocerite reaches slightly beyond the antennular peduncle. The outer margin is slightly convex and ends in a distinct tooth, which fails to reach the end of the lamella. The lamella is broad and has the anterior margin rounded. The antennal peduncle possesses no spine. The last segment of the peduncle fails to reach the middle of the scaphocerite.

The mandible (fig. 71a) has the incisorprocess provided with some small teeth at the concave margin, the distal margin of the process ends in three distinct teeth; the molar process bears some

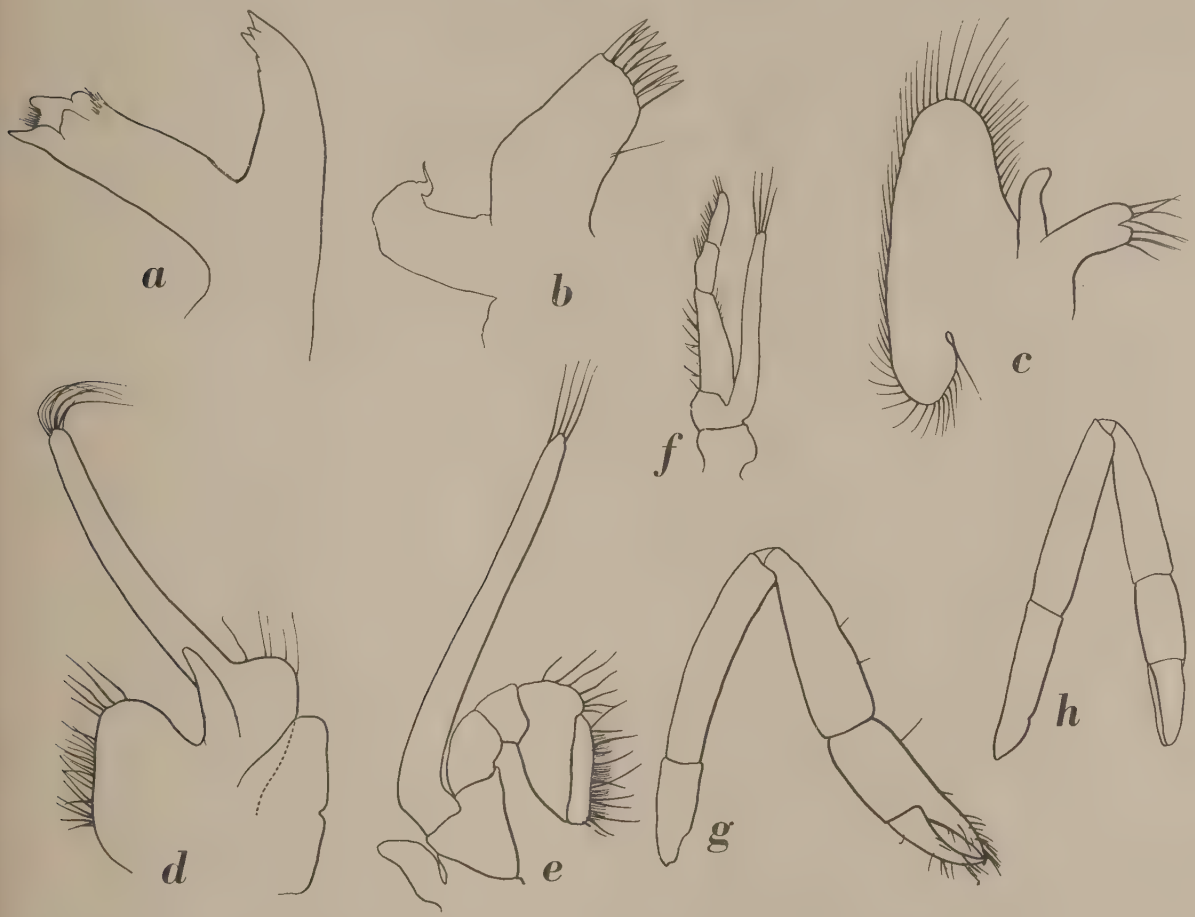


Fig. 71. *Pontoniopsis comanthi* Borr. a, mandible; b, palp and upper lacinia of maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, third maxilliped; g, first pereiopod; h, second pereiopod. a, b, × 200; c-e, × 100; f, × 21; g, h, × 50.

rows of spines. The maxillula (fig. 71b) has the inner lacinia slender, the upper lacinia is normal in shape, the palp is simple. The maxilla (fig. 71c) has the endite cleft, though not very deeply, the palp is well developed, the scaphognathite is large, but not broad. All maxillipeds have the exopods well developed. The first maxilliped (fig. 71d) shows no notch between the basis and the coxa, the palp is normal in shape, the caridean lobe of the exopod is not very broad, the epipod is shallowly bilobed. The second maxilliped (fig. 71e) is normal in shape, an epipod but no podobranch is present. The third maxilliped (fig. 71f) is short and reaches slightly beyond the base of the scaphocerite. The last two segments are short, of equal length and together about $^3/_4$ of the length of

the antepenultimate segment. The exopod is present and reaches beyond the end of the antepenultimate segment. No arthrobranch is present.

The first pereiopod (fig. 71g) reaches with the chela and the carpus beyond the scaphocerite. The chela is short and rather broad. The fingers are about as long as the palm and are gaping. The carpus is slightly longer than the chela, it is broadest anteriorly and narrows posteriorly. The merus is distinctly longer than the carpus. The ischium is very short. In my specimen only the left second pereiopod is present. This leg (fig. 71h) is shorter than the first pereiopod, it reaches only with the chela beyond the scaphocerite. The fingers are longer than the palm, broader than high, closing in the proximal and gaping in the distal part. The carpus is about as long as the chela. The merus is distinctly longer than the carpus. The ischium measures $^3/_4$ of the length of the merus. No spines are present on any of the segments. In all probability this is the smaller second leg, the larger therefore is lacking in my specimen. The last three pereiopods are rather slender. The dactylus is narrow, it is little more than $^1/_4$ of the length of the propodus and ends in an acute point; the lower margin of the dactylus possesses before the apex a small accessory claw, being thus bifid. Borradaile (1915, 1917) in his description states the dactylus to be simple, he probably overlooked the small accessory claw. The propodus bears some scattered setae, but no posterior spines are observed. The carpus measures $^2/_3$ of the length of the propodus and is slightly narrowed proximally. The merus is about as long as the propodus and is slightly broader in the proximal than in the distal part. The ischium is short.

The uropods are longer than the telson. The outer margin of the exopod is slightly convex and naked, it ends into two spines.

The eggs are proportionately large.

Vertical distribution. The species is a litoral form and according to Potts (1915) is associated with the crinoid *Comanthus timorensis* (J. Müller) (= *C. annulatum* (Bell)). This latter species is not recorded from Sta. 33 of the Siboga Expedition, so that *Pontoniopsis* perhaps also lives in association with other Crinoids.

Horizontal distribution. The only previous record is that of Borradaile (1915, 1917a) and Potts (1915) from Mabuiag, Torres Straits.

Pontonia Latreille, 1829

Kemp (1922) gave a key to the six Indo-Westpacific species of the present genus known at that time. After Kemp's publication only two new Indo-Westpacific species of *Pontonia* have been described in literature, namely *Pontonia medipacifica* Edmondson and *Pontonia katoi* Kubo. Up to the present time no species of *Pontonia* have been reported from the Malay Archipelago. The material of the present genus examined by me, all of which has been collected by the Siboga Expedition, consists of four species, one of which appears to be new to science.

The type of the present genus generally is named *Pontonia tyrrhena* (Petagna, 1792), but this name is incorrect. *Astacus tyrrhenus* of Petagna, namely, is a species of *Callianassa,* which is identical with *Callianassa laticauda* Otto, as is distinctly shown by Petagna's beautiful figure of his species. The first valid trivial name for the Pontonid is the name *pinnophylax* of Otto, which therefore has to be used, *Pontonia pinnophylax* being the correct name for the species.

The oral parts of all species at my disposal are examined, most of them are figured here;

figures of the oral parts of the type species of the present genus, *Pontonia pinnophylax* (Otto) (Mediterranean, leg. F. Cantraine, Museum Leiden) are given here too (figs. 72a-e). The general shape of the oral parts in *Pontonia* is as follows: Mandible without palp, incisor process

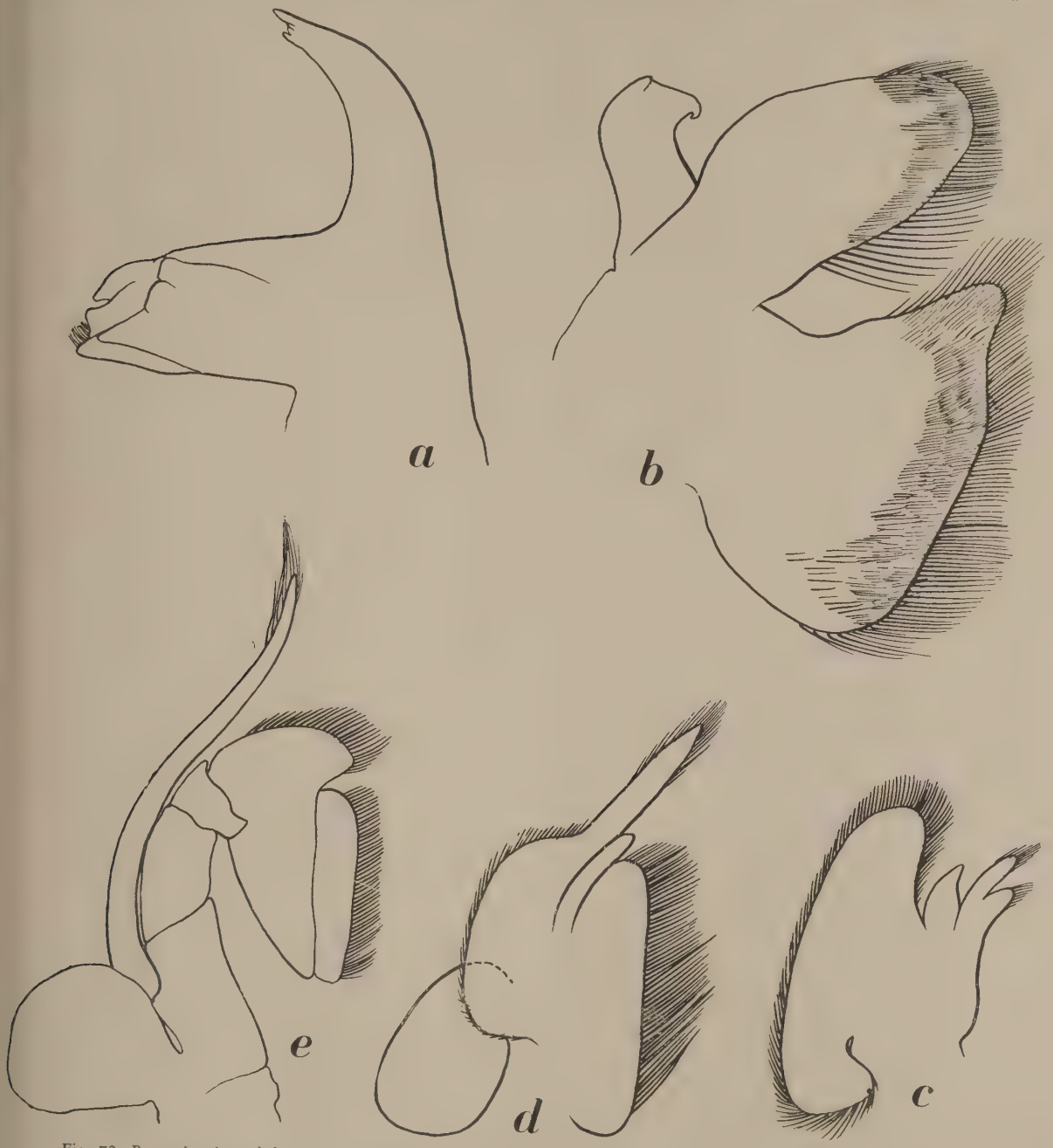


Fig. 72. *Pontonia pinnophylax* (Otto). a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped. a, b, × 36; c-e, × 12

slender, ending in four or more teeth, molar process stout, with the apex provided with blunt knobs and a row of spines. Maxillula with the inner lacinia broad (*P. pinnophylax, okai, ascidicola*) or

slender (*P. stylirostris, katoi*), the upper lacinia strong, sometimes very strong, and ending in hairs and spines, the palp distinctly or indistinctly bilobed. The maxilla with the endite cleft (sometimes very indistinctly so), the palp well developed, the scaphognathite large but not excessively broad. All maxillipeds provided with exopods. The first maxilliped without or with a very obscure notch between basis and coxa, the palp is well developed, the exopod bears an elongate caridean lobe, the epipod is simple or bilobed. The second maxilliped is normal in shape, the dactylus is fused for its entire length with the propodus, the epipod is well developed, no podobranch is present.

Like in *Paranchistus* the inner lacinia of the maxillula is not always broadened in the present genus; this character thus can not be used for separating these and related genera.

Pontonia katoi Kubo (figs. 73-77)

Pontonia katoi Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 55, figs. 21-23.

Siboga Expedition

Station 144, anchorage north of Damar Island (= Salomake); dredge, townet and reefexploration; depth 45 m; coral bottom and Lithothamnion; August 7-9, 1899. — 1 male 11 mm.

Station 301, Pepela Bay, eastcoast of Roti, 10° 38′ S, 123° 25′.2 E; in *Styela palinorsa* Sluit.; dredged in 27-45 m and reefexploration; bottom mud, coral and Lithothamnion; January 30 till February 1, 1900. — 1 ovigerous female 11 mm.

The rostrum is more or less directed downward and reaches somewhat beyond the antennular peduncle, it is depressed, broad at base and narrowing towards the top, being thereby triangular in dorsal view, with the apex pointed. The upper surface is provided with a low median carina, which is flanked at each side by a longitudinal shallow depression. The lower surface of the rostrum bears a high and sharp median carina, which abruptly ends anteriorly, the apex of the rostrum being thereby truncate in lateral view. The truncated apex bears a small anteroventral spine. There are no other teeth on the rostrum. The carapace is smooth and swollen, the anterior margin is provided with a strong antennal spine, which is placed just below the eye. The anterolateral angle is rounded and strongly forwards produced, reaching thereby to or beyond the base of the scaphocerite.

The abdomen is smooth. The pleurae of the first five segments are broadly rounded. The sixth segment is almost 1.5 times as long as the fifth, its pleurae are triangular in shape, with a rounded apex, the posterolateral angles of the sixth segment are rounded too.

The telson (figs. 74a, b) is about twice as long as the sixth abdominal segment, being somewhat more than twice as long as broad. The lateral margins are slightly convex. In my female specimen like in K u b o's male, there are two pairs of strong spines on the dorsal surface of the telson: the proximal pair is situated near the anterior margin of the telson, while the distal pair is placed in the middle of the telson. In my male specimen there are five pairs of dorsal spines, which are placed regularly along the lateral margins of the telson. The posterior margin of the telson bears three pairs of spines, the outer of which is very small, the two subequal inner pairs are much longer than the outer pair.

The eyes have the cornea about as broad as and distinctly shorter than the ophthalmic peduncle. The base of the ophthalmic peduncle is covered by the rostrum. The eyes almost reach the end o

the basal segment of the antennular peduncle. The cornea is hemispherical and a small ocellus is visible, it is fused with the cornea.

The antennular peduncle has the first joint broad, the stylocerite is broad and ends in a blunt point. The anterolateral angle of the basal segment is produced into a strong spine, which reaches

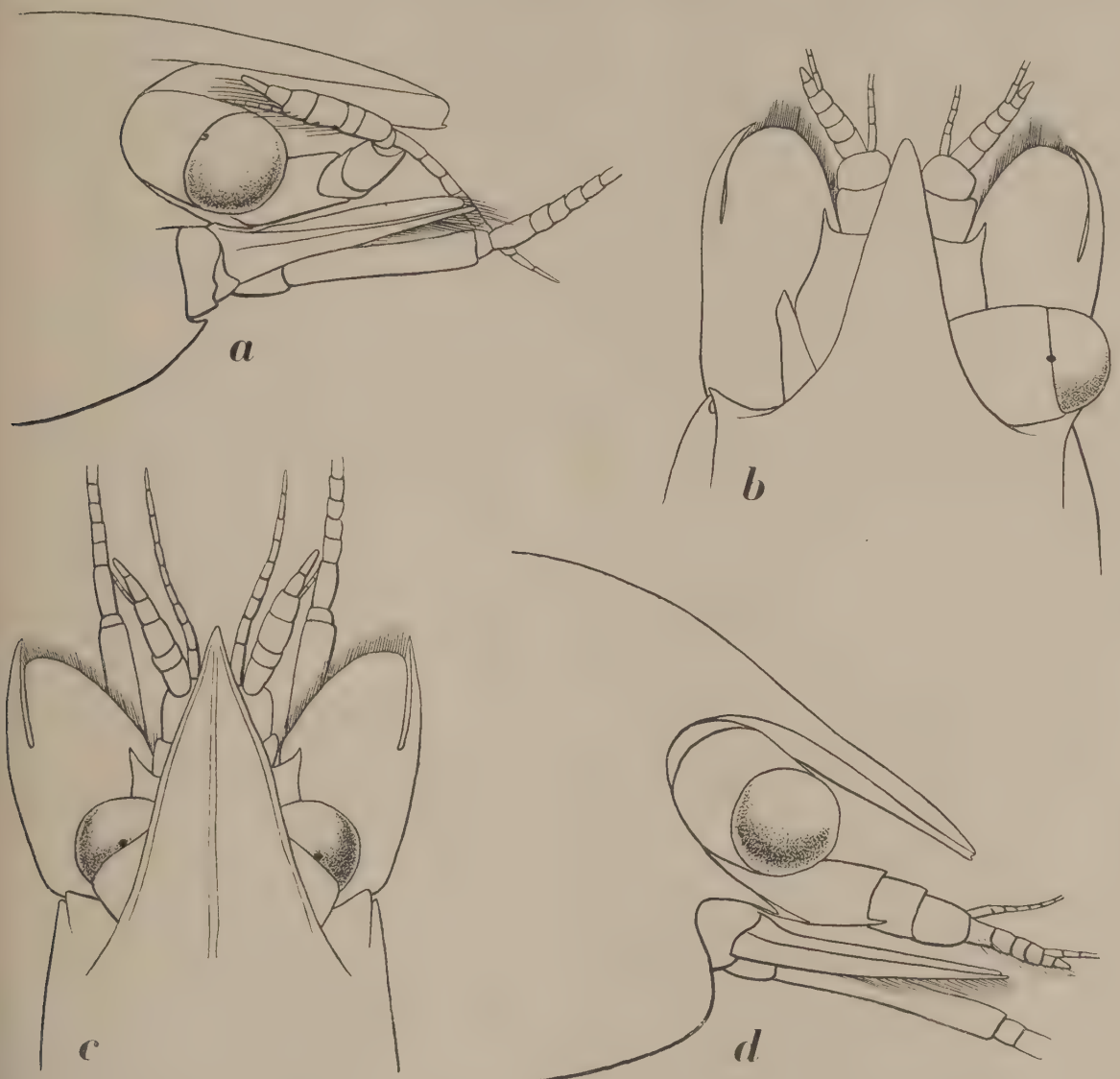


Fig. 73. *Pontonia katoi* Kubo. a, ♂, anterior part of body, lateral view; b, ♂, anterior part of body, dorsal view; c, ♀, anterior part of body, dorsal view; d, ♀, anterior part of body, lateral view. a-d, × 30.

distinctly beyond the middle of the second segment. The second and third segments are subequal in shape, they are much narrower than and together are about half as long as the first segment. The upper antennular flagellum is strongly curved backward and is concealed partly below the rostrum. The first four joints of the two rami of the upper antennular flagellum are fused and thickened, the free part of the shorter ramus is extremely short and consists of one or two joints.

The scaphocerite is short and broad, it reaches the end of the antennular peduncle, and is slightly less than twice as long as broad. The lamella is ovate, the outer margin is convex. The final tooth is very strong, being about half as long as the lamella and curved inward, it starts about halfway the outer margin of the lamella and reaches somewhat beyond the tip of it. The antennal peduncle fully reaches the end of the scaphocerite and bears no spine at its base.

The oral parts show no important differences from the general type. The mandible (fig. 75a) has the incisor process ending in four equal teeth, the molar process is provided with blunt teeth and a row of spines. The maxillula (figs. 75b, c) has the inner lacinia narrow, the palp is indistinctly

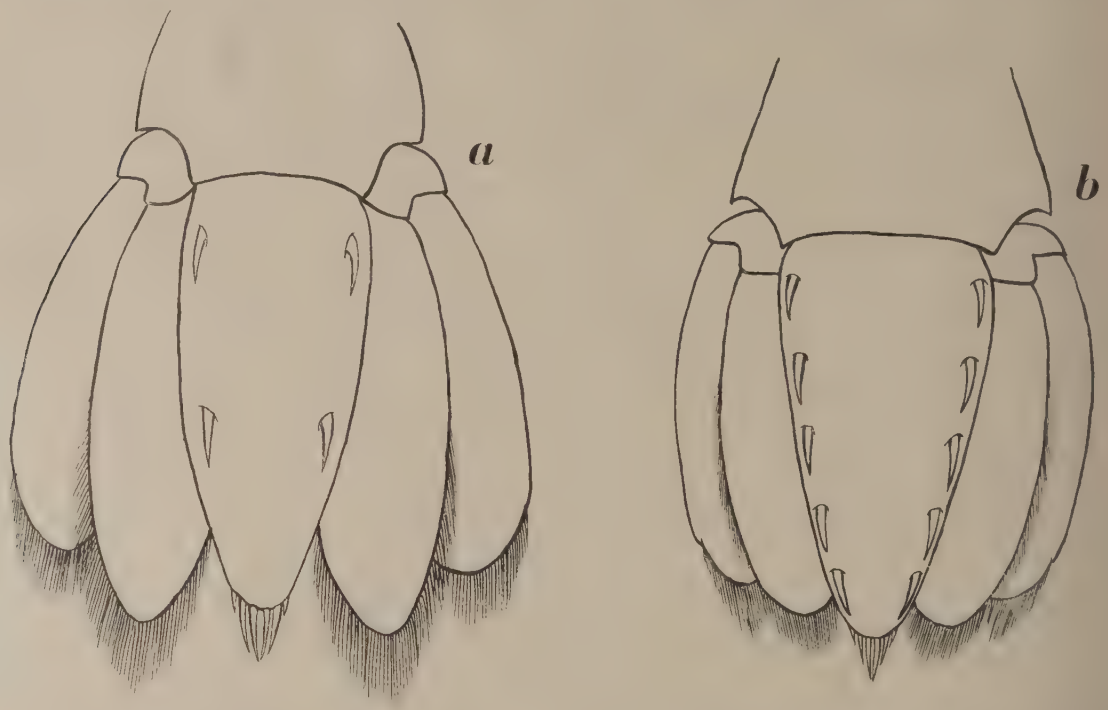


Fig. 74. *Pontonia katoi* Kubo. a, ♀, telson and uropods, dorsal view; b, ♂, telson and uropods, dorsal view. a, b, × 30.

cleft, in my male specimen the upper lacinia is excessively broadened, in the female it is normal in shape. The endite of the maxilla (fig. 75d) has the lower lobe narrower than the upper. The first maxilliped (fig. 75e) has the epipod distinctly bilobed. The second maxilliped (fig. 75f) is normal in shape. The third maxilliped (fig. 76a) reaches almost to the end of the first segment of the antennular peduncle. The penultimate joint is almost 1.5 times as long as the ultimate, both joints are slightly broadened. The antepenultimate segment is about twice as long as the penultimate, it is four times as long as broad and is somewhat broadened in the basal part. The exopod is well developed and reaches beyond the end of the antepenultimate segment.

The first pereiopod (figs. 76b, c) reaches with the chela and a part of the carpus beyond the scaphocerite. The fingers are slender, slightly longer than the palm, unarmed; they bear some tufts of setae. The carpus is longer than the chela, it is broadest anteriorly, narrowing posteriorly. The merus is about as long as the carpus. The ischium is shorter than half the carpus. The second pereiopods (figs. 76d-g) are equal in shape, but unequal in size and strength, they are stout and reach

with the entire chela beyond the scaphocerite. The fingers are about half as long as the palm, their tips are crossing. The dactylus is provided in the proximal part of the cutting edge with one large tooth; this tooth fits between two strong teeth of the cutting edge of the fixed finger. The palm is broad and somewhat swollen, no ventral carina could be observed. It is about half as long as broad. The carpus is triangular in shape, it is broadened anteriorly; its anterior surface is somewhat

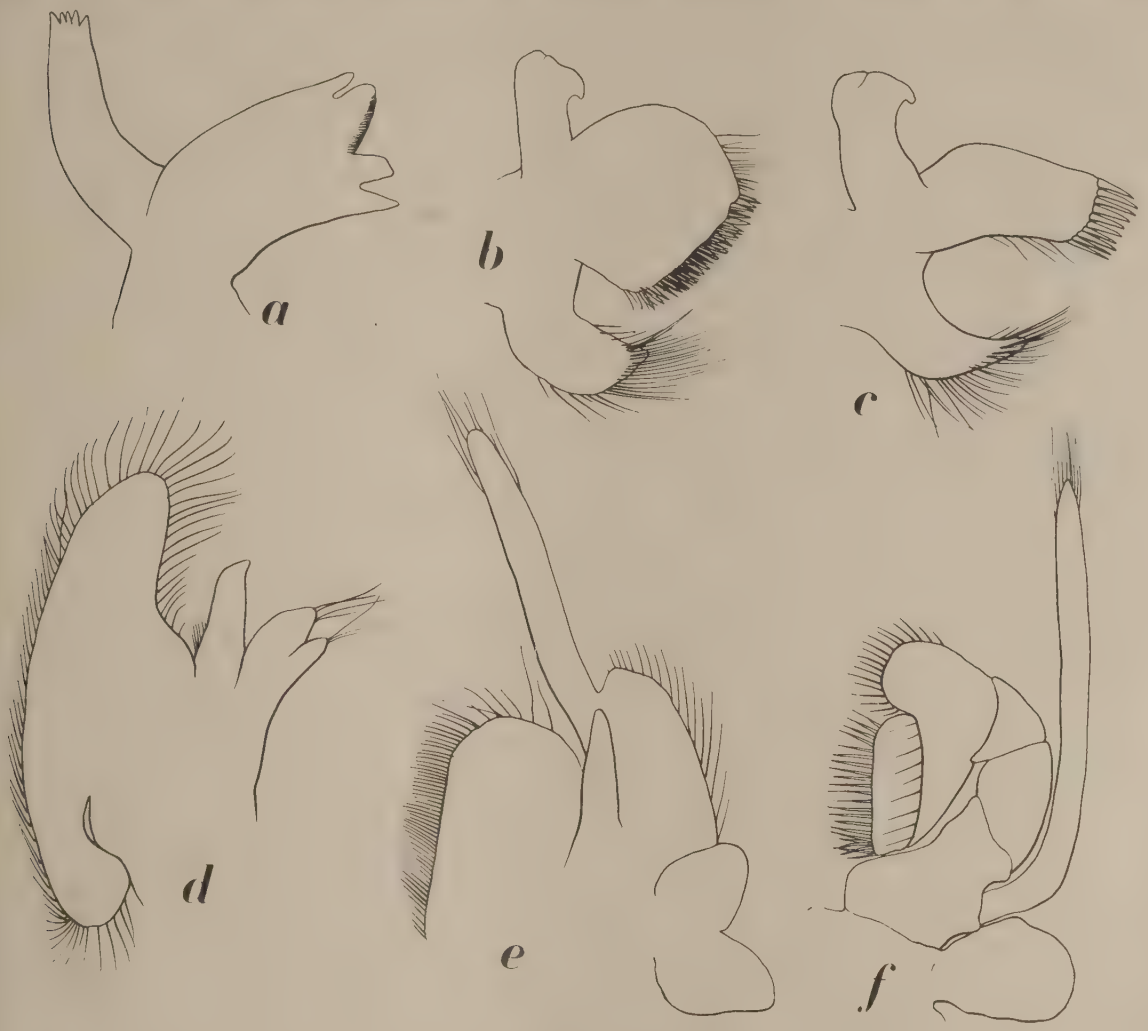


Fig. 75. *Pontonia katoi* Kubo. a, ♂, mandible; b, ♂, maxillula; c, ♀, maxillula; d, ♂, maxilla; e, ♂, first maxilliped; f, ♂, second maxilliped. a-c, × 60; d-f, × 50.

hollowed for the reception of the protruding posterior part of the palm. It is about half as long as the palm or somewhat shorter. The merus is somewhat longer than the carpus and is about twice as long as broad. Both merus and carpus are unarmed. The ischium is much compressed and is shorter than the merus, a small but distinct tooth is present in the distal part of the posterior margin. The last three pereiopods (figs. 77a, b) are rather stout and similar in shape mutually. The dactylus (figs. 77c, d) is short and broad, with both anterior and posterior margins convex, it ends into two claws, the upper of which is movable. In the basal part of the posterior margin the dactylus bears

a small but distinct, distally directed tooth, while a small denticle is situated on that posterior margin between the basal tooth and the lower claw, moreover some hairs are present on the dactylus. The propodus is three to four times as long as the dactylus and is 3.5 to 5 times as long as broad. The carpus measures $^2/_3$ of the length of the propodus. The merus is longer and distinctly broader than the propodus, while the ischium is about $^2/_3$ of the length of the merus.

The endopod of the first pleopod in the male (fig. 77e) is ovate in shape, and has the base broadened, the outer margin is slightly concave. The second pleopod of the male (fig. 77f) has the

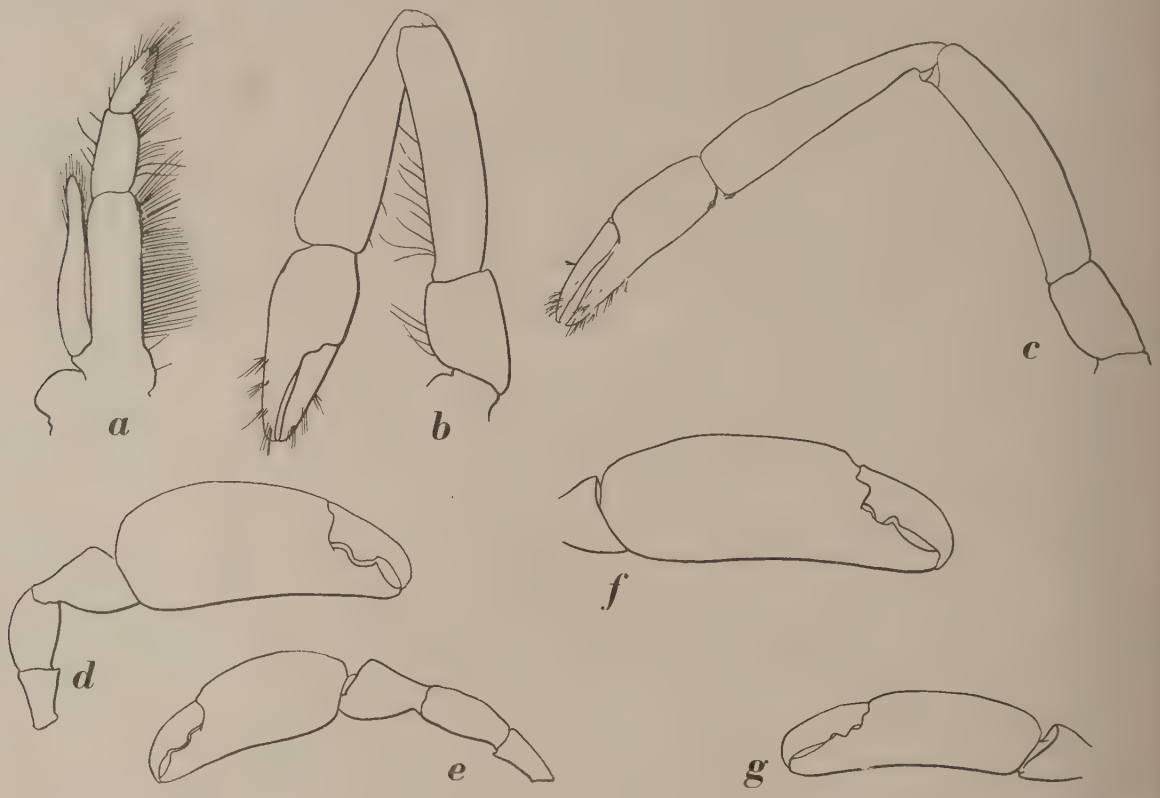


Fig. 76. *Pontonia katoi* Kubo. a, ♀, third maxilliped; b, ♀, first pereiopod; c, ♂, first pereiopod; d, ♀, larger second pereiopod; e, ♀, smaller second pereiopod; f, ♂, chela larger second pereiopod; g, ♂, chela smaller second pereiopod. a, b, × 30; c, × 25; d-g, × 8

appendix interna distinctly longer and slenderer than the appendix masculina. The other pleopods are normal in shape.

The uropods are ovate. The endopod is longer than the exopod and about as long as the telson. The outer margin of the exopod is convex and naked, it ends in a small spinule.

The specimen from Sta. 144 differs in some respects from that of Sta. 301:

1. The rostrum is broader and has the ventral carina somewhat deeper.
2. The telson is provided with five pairs of dorsal spines instead of two pairs.
3. The final tooth of the scaphocerite reaches slightly farther beyond the lamella.
4. The upper lacinia of the maxillula is excessively broadened.
5. The pereiopods are generally slightly more slender.

As one of the specimens is a male and the other a female, it at first was thought possible that

these differences are due to the different sex of the specimens. This, however, is not true as the specimen described and figured by K u b o (1940) is a male and agrees in all respects with my female specimen. It is therefore very well possible that my male specimen belongs to a distinct, as yet undescribed, species. Since the differences are so slight, and as the large number of dorsal spines on the telson may be an abnormality only, I think it better not to make the male specimen the type of a new species, until more material is available.

Pontonia katoi is most closely related to *Pontonia minuta* Baker, from which species it differs,

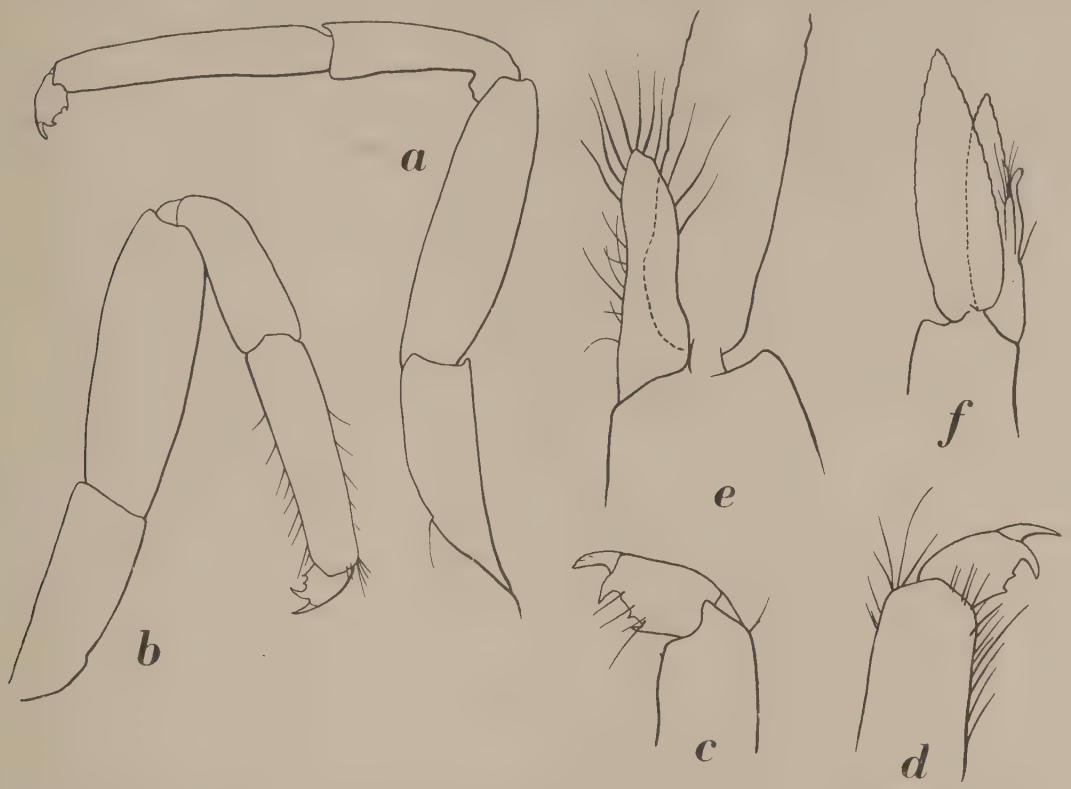


Fig. 77. *Pontonia katoi* Kubo. a, ♂, third pereiopod; b, ♀, third pereiopod; c, ♂, dactylus third pereiopod; d, ♀, dactylus third pereiopod; e, ♂, first pleopod; f, ♂, second pleopod. a, b, × 30; c-e, × 75; f, × 38.

as far as I can conclude from B a k e r's (1907) description and figures, in the following points:

1. The third maxilliped has the last joint shorter and has the exopod better developed.
2. The second pereiopods in *P. minuta* are figured without teeth on their fingers, also in the description nothing is mentioned of those teeth, so that one may conclude that the fingers are entire.
3. The last pereiopod of B a k e r's species is insufficiently described by that author, the dactylus being described as follows: "the dactylus is strong, simple—or perhaps a little bifid at the tip—slightly curved, and is without a basal thickening." In *Pontonia katoi* the dactylus is very distinctly bifid.
4. The scaphocerite of *Pontonia minuta* is figured with a rather short final tooth, while in *P. katoi* this tooth is very long.

Reexamination of the type of *Pontonia minuta* perhaps will give more definite details about the above differences, which all are rather vague.

Vertical distribution. The species is a litoral form and is known from depths up to 45 m. It inhabits the branchial chamber of ascidians. K u b o (1940) records it from the branchial chamber of *Halocynthia ritteri* Oka, while one of the present specimens was found in *Styela palinorsa* Sluit.

Horizontal distribution. Except for the present records from the Malay Archipelago, the species only is known from off Simoda, Siduoka prefecture, Honshu, Japan (K u b o, 1940).

Pontonia okai Kemp (fig. 78)

Pontonia okai Kemp, 1922, Rec. Indian Mus., vol. 24, p. 261, figs. 89-92.
Pontonia okai Harant, 1931, Ann. Inst. océanogr. Monaco, n. ser. vol. 8, p. 368.

Fig. 78. *Pontonia okai* Kemp. a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped. a, × 150; b-e, × 75.

Siboga Expedition

Station 49a, Sape Strait, 8° 23'.5 S, 119° 4'.6 E; in the branchial sac of *Corella aequabilis* Sluit.; dredge; depth 69 m; bottom coral and shells; April 14, 1899. — 1 specimen 6 mm.

The specimen agrees well with K e m p's description. The oral parts of the species are figured here. The mandible (fig. 78a) is peculiar by having 3 small teeth on the concave margin of the

incisorprocess, placed close to the six teeth on the distal margin of that process. The maxillula (fig. 78b) has the inner lacinia broad and the palp distinctly cleft. In the maxilla (fig. 78c) the endite is feebly bilobed and the palp is very broad. The first maxilliped (fig. 78d) is narrow, the basis and coxa are not separated, the epipod is entire. The second maxilliped (fig. 78e) is normal in shape.

The present specimen is somewhat damaged, it lacks the smaller leg of the second pair and some of the ambulatory legs. Like in all specimens of the present genus examined by me the thicker flagellum of the antennula is strongly curved backward and partly covered by the rostrum.

Vertical distribution. K e m p's specimens were captured at a depth of 72 to 88 m, they inhabited the branchial sac of the ascidian *Ascidia willeyi* Oka. The present specimen was captured at a depth of 69 m and was found in the branchial sac of *Corella aequabilis* Sluit., also an ascidian.

Horizontal distribution. K e m p recorded the species from off Cape Negrais, Burma (15° 25′ N, 93° 45′ E).

Pontonia ascidicola Borradaile (figs. 79-81)

Pontonia ascidicola Borradaile, 1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 389.
Pontonia ascidicola Borradaile, 1899, Willey's Zool. Res., vol. 4, p. 409, pl. 36 fig. 6.
Pontonia ascidicola Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 391.
Pontonia ascidicola Kemp, 1922, Rec. Indian Mus., vol. 24, p. 261.
Pontonia ascidicola Harant, 1931, Ann. Inst. océanogr. Monaco, n. ser. vol. 8, p. 368.
Pontonia ascidicola Calman, 1939, Sci. Rep. John Murray Exped., vol. 6, p. 216.

Siboga Expedition

Station 220, anchorage off Pasirpandjang, westcoast of Binongko, S.E. of Celebes; in *Ascidia empheres* Sluit.; Hensen vertical net; depth 278 m; bottom coral sand; November 1-3, 1899. — 2 specimens 6 and 8 mm.

The rostrum is short, downcurved and reaches to the middle of the first segment of the antennular peduncle, it ends in a rather sharp apex. The base is rather broad, narrowing towards the apex. There are no teeth on the upper or on the lower surface. The upper surface is provided with a longitudinal median carina; a carina is present also on the lower surface of the rostrum. The carapace is smooth and more or less swollen. The antennal spine is strong, no other spines are present. The anterolateral angle of the carapace is rounded.

The abdomen is smooth. The pleurae of the first five segments are rounded. The sixth segment is somewhat longer than the fifth. The pleura of the sixth segment is pointed, the posterolateral angles are rounded.

The telson (fig. 79c) is about twice as long as broad, and about twice as long as the sixth abdominal segment. The dorsal surface is provided with two pairs of spines, the anterior of which is placed close to the anterior margin of the telson, the posterior pair is placed closer to the anterior pair than to the posterior margin of the telson. This posterior margin bears the usual three pairs of spines, the two inner pairs are of about the same length, the outer pair being much shorter.

The eyes fail to reach the end of the first segment of the antennular peduncle. The cornea

is small and much narrower than the stalk. The external side of the stalk is evenly rounded, the inner surface bears a blunt process near the base of the cornea.

The antennular peduncle reaches as far forward as the antennal peduncle. The basal segment of it is broadest at base and narrows anteriorly. The stylocerite is short and broad and ends in a blunt point, it fails to reach the middle of the basal antennular segment. The anterior margin of the first segment is produced into two blunt teeth, the outer of which reaches slightly further than the inner, it reaches almost the middle of the second segment. The inner tooth sometimes is reduced. The second segment of the antennular peduncle is slightly longer and broader than the third segment, together

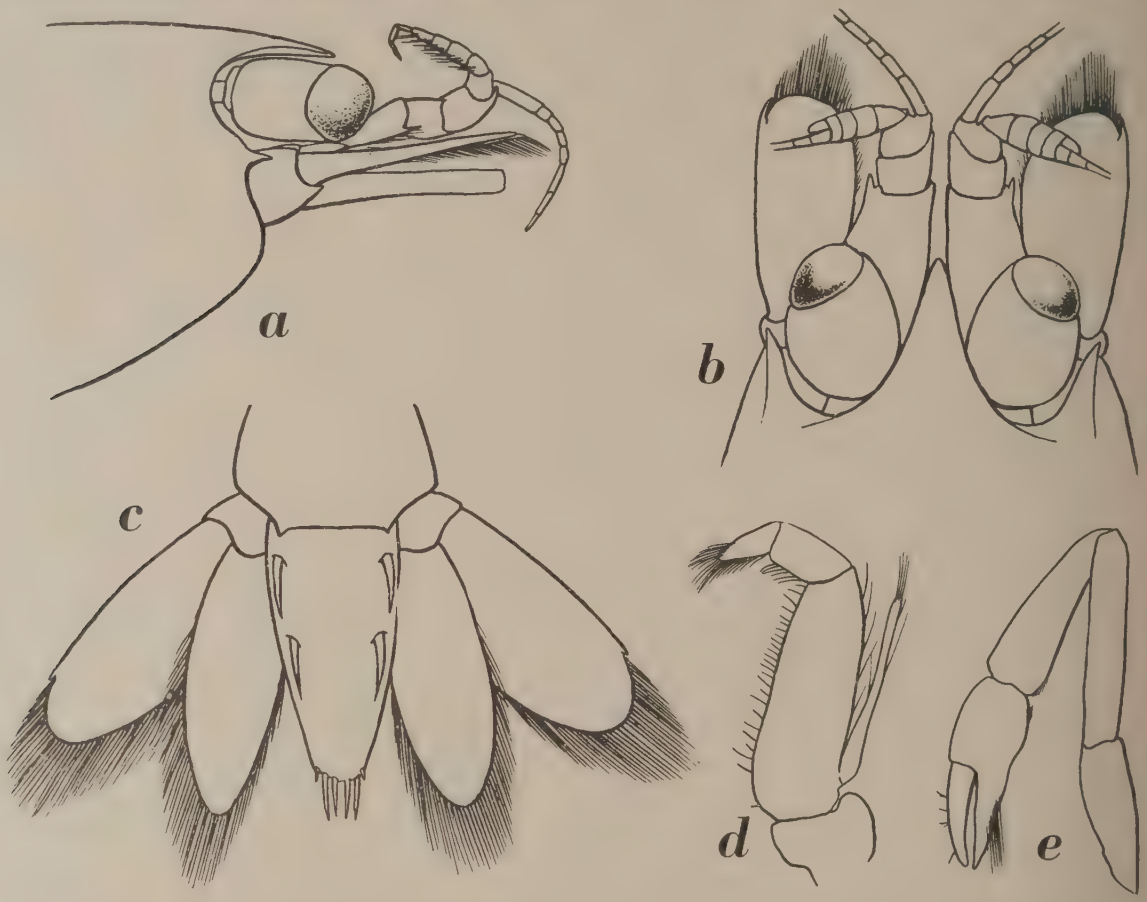


Fig. 79. *Pontonia ascidicola* Borr. a, anterior part of body, lateral view; b, anterior part of body, dorsal view; c, telson and uropods, dorsal view; d, third maxilliped; e, first pereiopod. a-e, × 36.

the two segments are less than half as long as the first. The upper antennular flagellum has the two rami fused for four joints, the free end of the shorter ramus is extremely short.

The scaphocerite reaches slightly beyond the antennular and antennal peduncles, it is almost twice as long as broad. The outer margin is convex and ends in a distinct tooth, which is curved inward; this tooth overreaches the lamella. The antennal peduncle is very long and reaches as far forward as the antennular. No spine is present at the base of the antennal peduncle.

The oral parts (figs. 80a-e) are quite typical for the genus. The maxillula has the inner lacinia broad and the palp very indistinctly bilobed. The endite of the maxilla ends into two short lobes.

The epipod of the first maxilliped is entire. The other parts are normal in shape. The third maxilliped (fig. 79d) reaches almost to the end of the first segment of the antennular peduncle. The ultimate segment is somewhat shorter than the penultimate. The antepenultimate segment is broad, being slightly more than $2^1/_2$ times as long as broad, it is distinctly longer than the last two segments together. The exopod reaches almost the end of the antepenultimate segment.

Fig. 80. *Pontonia ascidicola* Borr. a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, third pereiopod. a, b, × 67; c-e, × 34; f, × 28.

The first pereiopods (fig. 79e) reach with the entire chela beyond the scaphocerite. The fingers are about as long as or slightly longer than the palm, the cutting edges are unarmed. The carpus is almost as long as the chela (not slightly longer as in B o r r a d a i l e's specimen), it narrows inconspicuously posteriorly. The merus is distinctly longer than the carpus. The ischium measures about $^3/_4$ of the length of the merus. The second pereiopods (fig. 81a, b) are strong and unequal. The stronger chela has the fingers half as long as the palm, the tips are crossing. The dactylus is provided with one strong ventral tooth, which is placed slightly behind the middle of the cutting edge; the apex of this tooth is slightly curved posteriorly. The fixed finger has the proximal half of the cutting edge provided with two teeth, which are directed anteriorly; the foremost of these teeth is broad and rounded, the posterior is narrower and has the apex more acute. The palma is

broadest at base, swollen and without a sharp ventral carina; its length is about twice its greatest breadth. The carpus is short, triangular and unarmed, it measures about $^1/_3$ of the length of the palm and is much narrower than it. The merus is half as long as the palm, more or less compressed, unarmed and with an excavation in the anterior part of the ventral surface. The ischium measures about $^2/_3$ of the length of the merus. The smaller second leg has the fingers longer than half the length of the palm. The cutting edges of the fingers bear similar teeth as in the stronger leg, they only are less conspicuous. The carpus is as long as the fingers. The shape and the relative length of the other joints

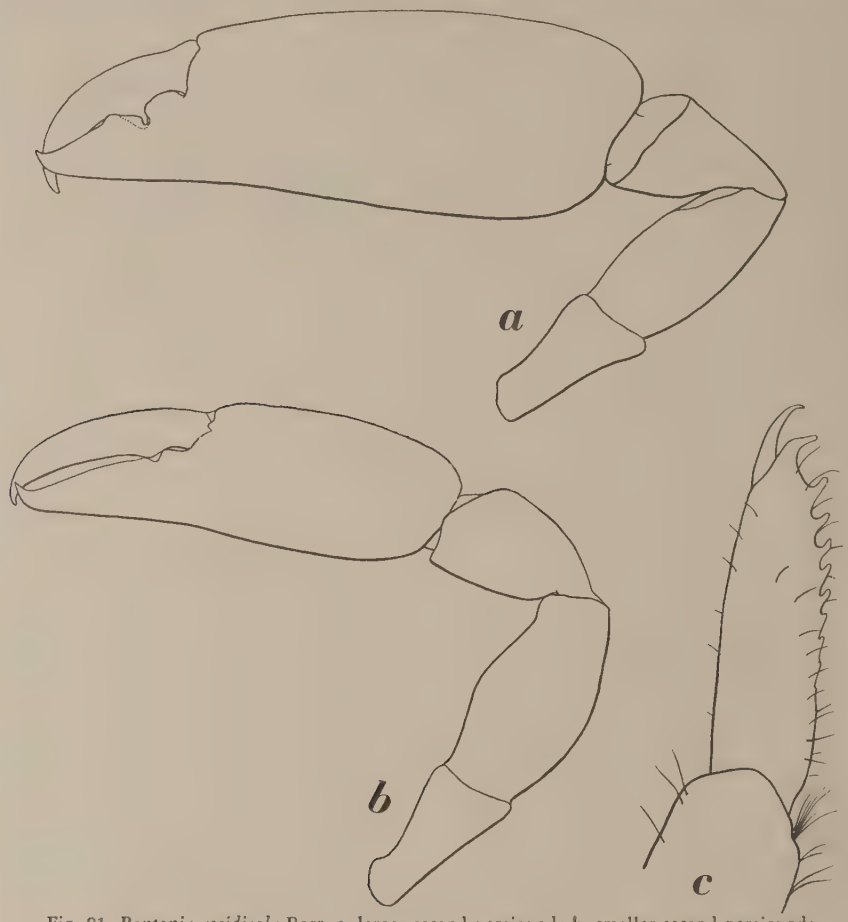


Fig. 81. *Pontonia ascidicola* Borr. a, larger second pereiopod; b, smaller second pereiopod; c, dactylus third pereiopod. a, b, × 21; c, × 200.

is like in the stronger leg. The third pereiopod (fig. 80f) has the dactylus (fig. 81c) slender, biunguiculate; the upper claw may articulate with the rest of the dactylus; proximally of the two claws the posterior margin of the dactylus bears about six small additional teeth. The propodus is about 3.5 times as long as the dactylus and about 6 times as long as broad, it is not provided with posterior spines. The carpus is slightly longer than half the propodus. The merus is about as long as the propodus. The length of the ischium is about $^5/_6$ of that of the merus. The fourth and fifth pereiopods are about similarly built as the third.

The exopod of the uropod is as long as the telson and shorter than the endopod; the outer margin is convex and ends in a single spine.

The only difference between the specimens at hand and Borradaile's description lies in the relation of the various joints of the first pereiopod; these differences, however, are too small to be of specific value. The species is closely related to *Pontonia okai.*

Distribution. According to Borradaile (1917a) the species inhabits an ascidian, which is in good agreement with the fact, that the specimens from the Siboga Expedition are obtained from *Ascidia empheres* Sluit. In literature the species only has been recorded from Blanche Bay, New Britain (Borradaile, 1898a, 1899).

Pontonia stylirostris nov. spec. (figs. 82-84)

Siboga Expedition

Station 164, between Misool and New Guinea, 1° 42'.5 S, 130° 47'.5 E; dredge; depth 32 m; bottom sand, small stones and shells; August 20, 1899. — 1 specimen 15 mm.

The rostrum is long, reaching almost to the end of the antennular peduncle; it is styliform and cylindrical, little or not at all broadened at the base. The upper margin bears two teeth near

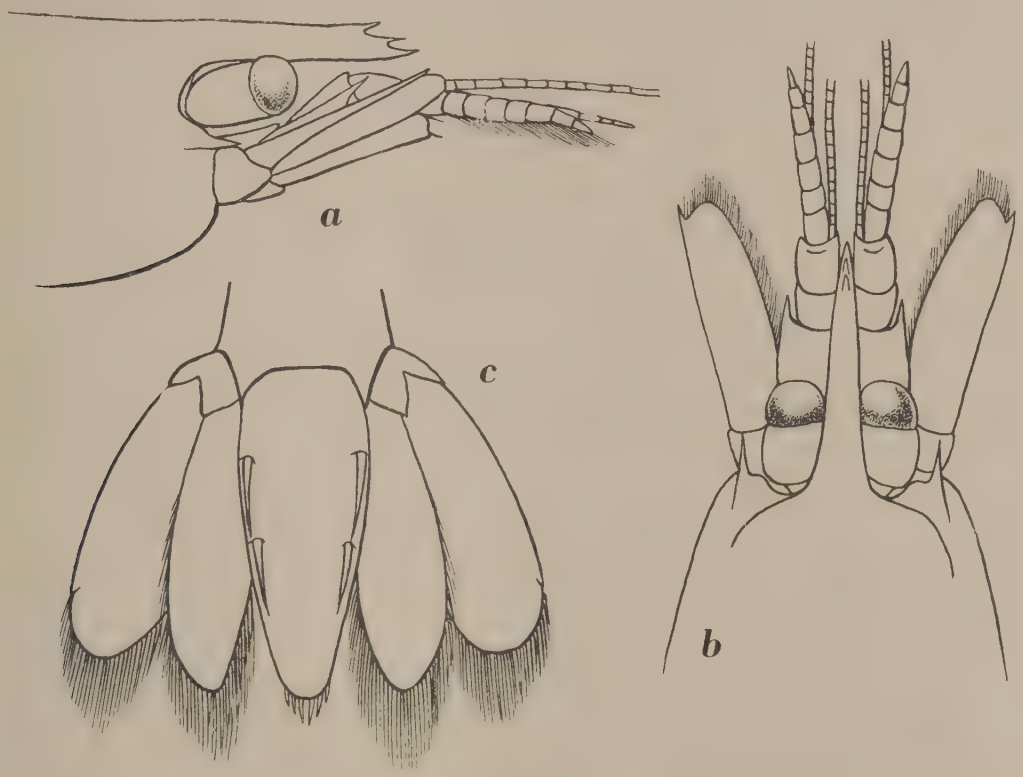


Fig. 82. *Pontonia stylirostris* nov. spec. a, anterior part of body, lateral view; b, anterior part of body, dorsal view; c, telson and uropods, dorsal view. a-e, × 20.

the apex, the lower margin and the rest of the upper margin are unarmed. The carapace is smooth and provided with a strong antennal spine only. The anterolateral angle is rounded.

The abdomen is smooth. The pleurae of the first five segments are broadly rounded, that of

the sixth segment is acute. The posterolateral angle of the sixth abdominal segment is pointed. The sixth segment is somewhat longer than the fifth.

The telson (fig. 82c) is almost twice as long as the sixth abdominal segment and is more than twice as long as broad. The dorsal surface is provided with two pairs of very long and strong spines. The posterior pair of these spines measures about $^1/_4$ of the length of the telson; the bases of these posterior spines lie about in the middle of the length of the telson. The bases of the anterior

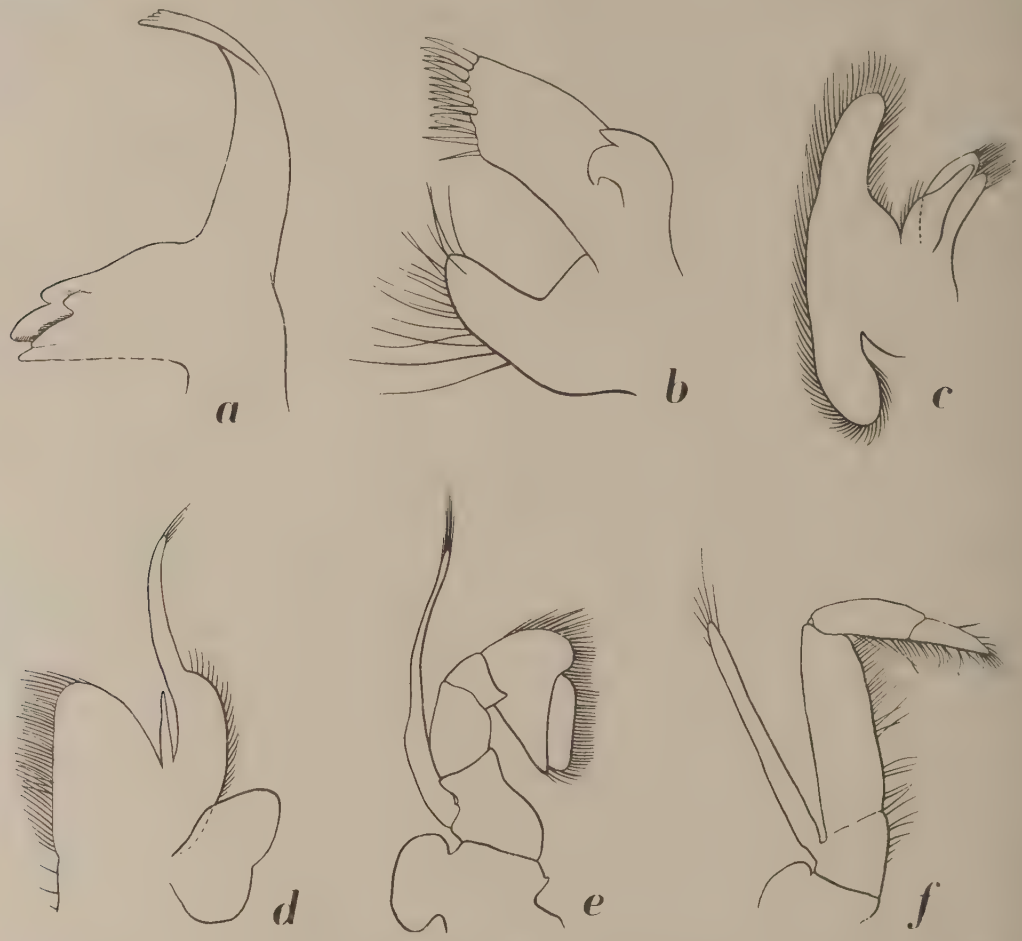


Fig. 83. *Pontonia stylirostris* nov. spec. a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, third maxilliped. a, b, × 75; c-e, × 37; f, × 30.

spines lie midway between the anterior margin and the bases of the posterior pair of spines. The posterior margin of the telson is provided with the usual six spines, the outer of which are extremely short, the two inner pairs are subequal and much longer than the outer pair.

The eyes are rather small and reach slightly beyond the middle of the basal segment of the antennular peduncle. The eyestalk is slightly longer and broader than the cornea, which is hemispherical.

The basal segment of the antennular peduncle is not very broad, it is about $2^1/_2$ times as long as broad. The stylocerite is slender and pointed, it reaches almost the middle of the first segment. The anterolateral spine of the first segment is strong and reaches beyond the middle of the second

segment of the antennular peduncle. This second segment is about as long and as broad as the third segment; together the second and third segments are about half as long as the first. The upper antennular flagellum has the fused portion of the two rami thickened and consisting of 5 joints. The free part of the shorter ramus is extremely short and consists of two or three joints.

The scaphocerite reaches to the end of the antennular peduncle; it is rather slender, being broadest in the middle and narrowing anteriorly. The anterior margin of the scaphocerite is rounded. The outer margin is convex and ends in a distinct tooth, which fails to reach the end of the lamella. The antennal peduncle reaches as far forward as the antennular peduncle. No spine is present at the base of the antennal peduncle.

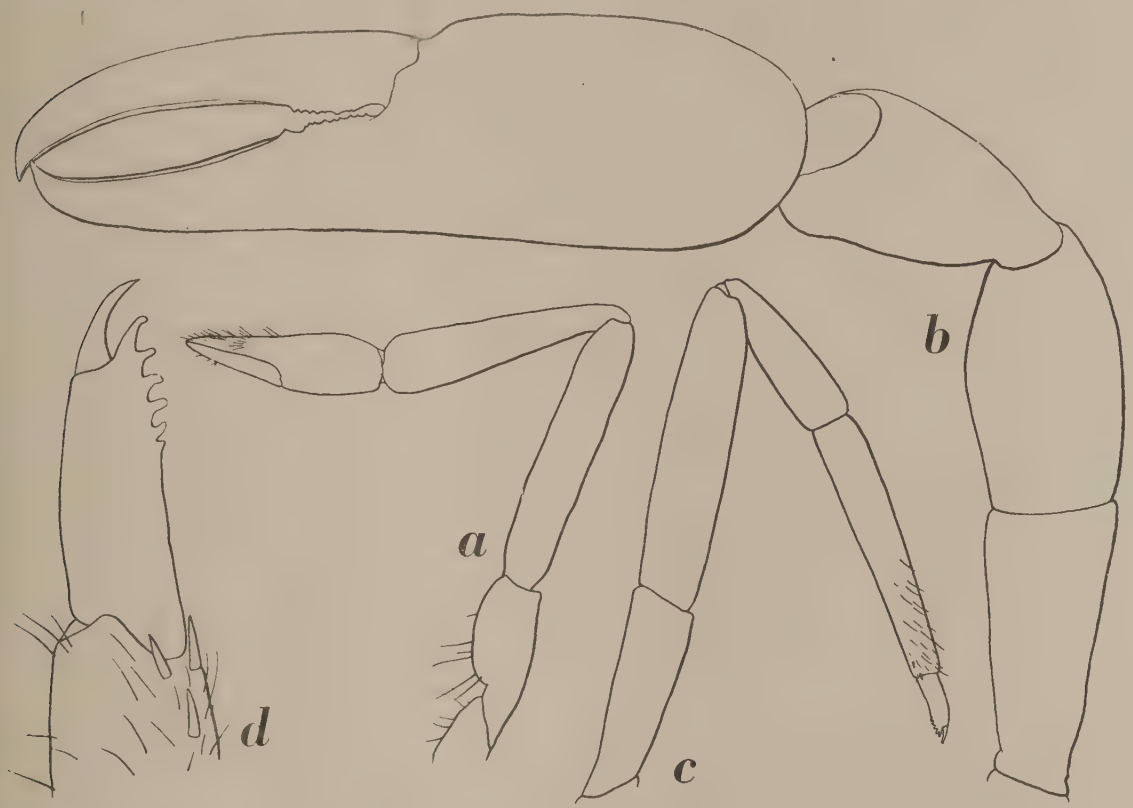


Fig. 84. *Pontonia stylirostris* nov. spec. a, first pereiopod; b, second pereiopod; c, third pereiopod; d, dactylus third pereiopod. a-c, × 25; d, × 120.

The mandible (fig. 83a) has the incisor process very long and slender, with the apex strongly curved forwards. The maxillula (fig. 83b) has the inner lacinia slender, the upper lacinia is normal in shape and the distinctly bilobed palp is remarkably short. The maxilla (fig. 83c) has the endite distinctly bilobed, the palp is much broadened in the basal part and the scaphognathite is very slender. The first maxilliped (fig. 83d) is normal in shape, a very indistinct notch separates the basis and coxa, the epipod is feebly bilobed. The second maxilliped (fig. 83e) is normal in shape. The third maxilliped (fig. 83f) reaches slightly beyond the base of the scaphocerite. The last segment measures $^{3}/_{4}$ of the length of the penultimate segment. The antepenultimate segment is about four times as

long as broad, it is much longer than the ultimate and penultimate segments combined. The exopod is well developed and reaches slightly beyond the penultimate segment.

The first pereiopod (fig. 84a) reaches with the chela and part of the carpus beyond the scaphocerite. The fingers are about as long as the palm, they are unarmed and provided with many tufts of setae. The carpus is somewhat longer than the chela. The merus is slightly longer than the carpus. The ischium is short. The second pereiopod (fig. 84b) is strong (in my specimen only the right second pereiopod is present). It reaches with the entire chela beyond the scaphocerite. The fingers are slightly longer than the palm and have the tips crossing. The cutting edge of the dactylus possesses in the proximal part about six small denticles. The fixed finger has about 8 similar denticles in the proximal part of the cutting edge. The denticles of both fingers are placed opposite one another. The distal part of the cutting edges of both fingers is entire and more or less concave, so that the fingers in the distal part are gaping when closed. The palm is somewhat swollen and is almost twice as long as broad. The carpus is about half as long as broad, it is broadest anteriorly and narrows posteriorly. The merus measures about 3/4 of the length of the palm. The ischium is as long as the merus. The last three pereiopods are slender. The third (fig. 84c) reaches beyond the scaphocerite. The dactylus (fig. 84d) is rather broad and ends into two claws, the upper of which articulates with the rest of the dactylus; behind these two claws a row of 4 to 6 small teeth are present on the posterior margin of the dactylus, these teeth become smaller proximally. The propodus is 4 to 5 times as long as the dactylus; the distal part of the posterior margin of the propodus is provided with some small spinules. The carpus is about half as long as the propodus. The merus is longer than the propodus. The ischium is rather more than half as long as the propodus.

The uropods are about as long as the telson. The exopod is slightly shorter than the endopod. The outer margin of the exopod is convex, naked and ends in a small tooth.

The present species in the shape of the dactyli of the last three pereiopods shows most affinity to the Indo-Westpacific species *P. ascidicola, anachoreta* and *okai,* it differs, however, from these and almost all species of the present genus by the long and slender rostrum, and by having two dorsal teeth on the rostrum (a feature hitherto not recorded in the present genus).

Platycaris nov. gen.

Definition. Pontoniid prawns of unknown association. Body strongly depressed. Rostrum broad, strongly depressed, toothless. Carapace smooth, devoid of antennal, hepatic and supraorbital spines.

Abdomen smooth. Pleurae of first five segments broadly rounded. Sixth segment rather short.

Telson short, ovate. Dorsal surface with 1 (?) pair of spines. Posterior margin with three pairs of long spines.

Eyes well developed; cornea hemispherical.

Basal segment of antennula broad, anterolateral angle rounded; stylocerite well developed, reaching beyond middle of basal segment. Last two segments short. Upper antennular flagellum with two rami.

Scaphocerite broad; final tooth small, overreached by the lamella. Antennal peduncle without external spine; last joint of antennal peduncle reaching as far forward as the scaphocerite.

Mandible without palp, incisor and molar processes slender. Inner lacinia of maxillula slender. palp not bilobed. Maxilla with scaphognathite broad, palp well developed, endites absent (?). All

maxillipeds with well developed exopods. Second maxilliped without podobranch. Third maxilliped with arthrobranch.

First pereiopods rather clumsy. Second pereiopods unknown. Last three pereiopods relatively stout, dactylus simple, strongly curved.

Endopod of the first pleopod of the male oval in shape.

Uropods oval in shape, rather broad. Exopod with the outer margin ending in one movable spine.

Type species: *Platycaris latirostris* nov. spec.

The present new genus is erected for a new species, which is represented by one single specimen in the collection of the Snellius Expedition. It is much to be regretted that the specimen lacks both second pereiopods, but the other characters show that it can not be placed in any of the known Pontoniid genera. The genus is most closely related to *Pontonia,* but differs from that genus by the shape of the antennular peduncle, by the shape of the telson and by the presence of an arthrobranch at the base of the third maxilliped and also by the much more depressed shape of the body, furthermore the present specimen lacks the antennal spine, which is present in the Indo-West-pacific species of the genus *Pontonia.*

Platycaris latirostris nov. spec. (figs. 85, 86)

Snellius Expedition

Ende, Flores; November 6-8, 1930. — 1 specimen 7 mm.

The body is very strongly depressed. The rostrum is depressed and broad, it bears no teeth and has the tip slightly curved downward; it does not reach the end of the first segment of the antennular peduncle. Laterally the rostrum is expanded over the bases of the eyes, the lateral margins are convex, the apex is sharply pointed; ventrally it is provided with a median carina. The carapace is strongly depressed, smooth and bears neither antennal nor hepatic nor supraorbital spines, the lower orbital angle is not prominent, the region behind the orbit is strongly hollowed. The anterolateral angle of the carapace is broadly rounded.

The abdomen is smooth, the first three segments are broad in dorsal view, the last three segments are much narrower. The pleurae of the first five segments are broadly rounded, that of the sixth segment is pointed, the posterolateral angle of the sixth segment too is pointed. The sixth segment is rather short, it is about $1^1/_2$ times as long as the fifth.

The telson (fig. 85c) is much shorter than the uropods, it is slightly longer than the sixth abdominal segment, and it is about twice as long as its own basal breadth. The dorsal surface of the telson in my specimen bears only one distinct spine, which is situated in the middle of the right lateral margin, on the left side of the telson no spine could be detected. The posterior margin of the telson bears three pairs of long spines, the outer of which is the shortest, the two inner pairs are subequal in length.

The eyes are slender, they reach distinctly beyond the rostrum. The cornea is hemispherical, it is much shorter than and about as broad as the stalk. No ocellus is visible.

The basal segment of the antennular peduncle is broad; the stylocerite is rather broad and ends

in a sharp point, it reaches distinctly beyond the middle of the first segment of the peduncle. The anterolateral angle of the basal segment of the peduncle is broadly rounded. The second segment is as broad as and much shorter than the third; together these two segments measure about $^{2}/_{3}$ of the length of the basal segment. The upper antennular flagellum has the fused part broadened and consisting of 5 joints. The free part of the shorter ramus is extremely short and is composed of 2 joints, the longer ramus is slender and consists of many joints. The lower flagellum is slender.

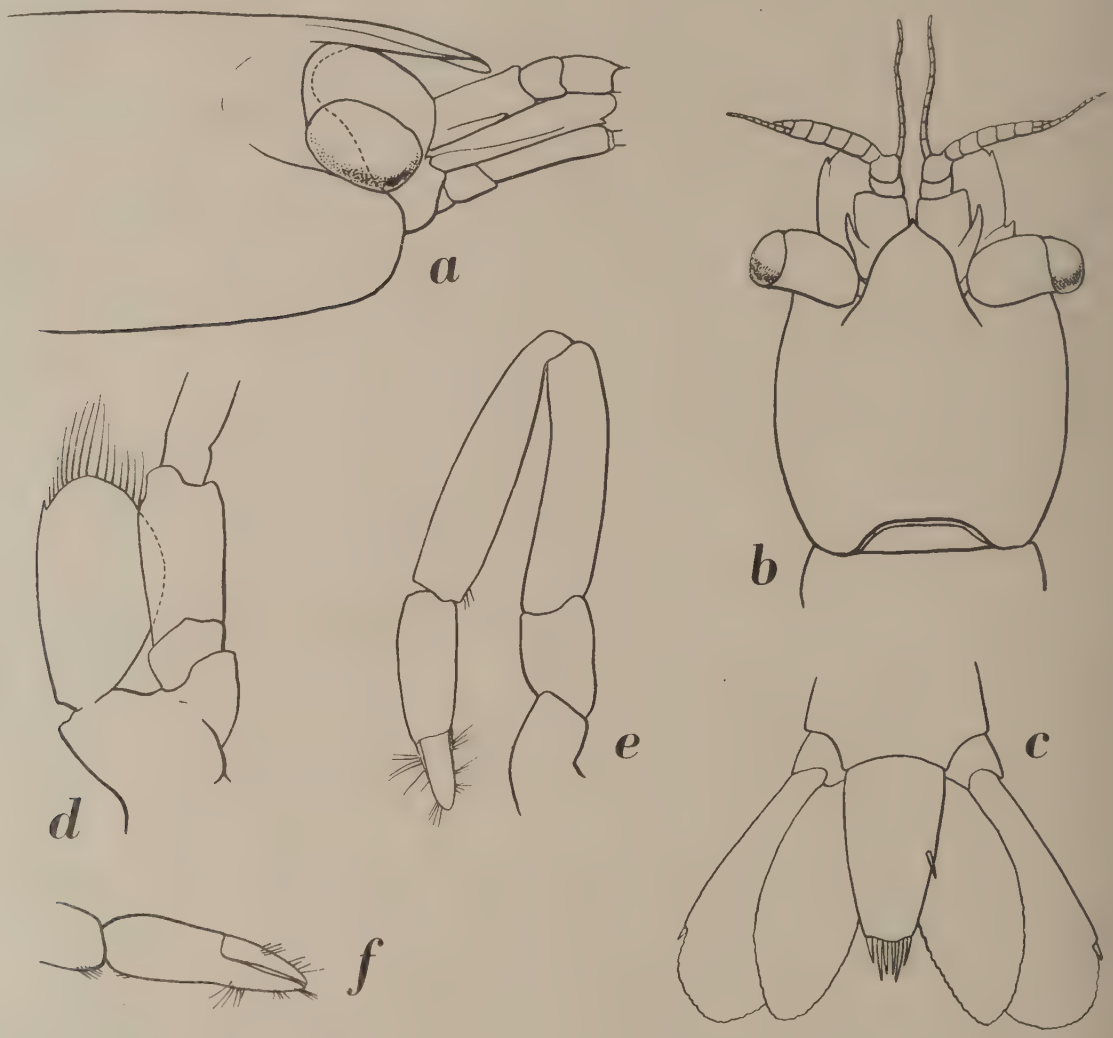


Fig. 85. *Platycaris latirostris* nov. gen. nov. spec. a, anterior part of body, lateral view; b, anterior part of body, dorsal view; c, telson and uropods, dorsal view; d, antenna; e, first pereiopod with chela in dorsal view; f, chela of first pereiopod, lateral view. a, × 36; b, c, × 18; d-f, × 42.

The scaphocerite (fig 85d) reaches slightly beyond the antennular peduncle, it is rather broad and has the outer margin slightly convex and ending in a small tooth, which is overreached by the lamella. The lamella is broad, it is rounded anteriorly. The antennal peduncle reaches as far forward as the scaphocerite, it bears no external spine at its base. The antennal flagellum is about as long as the body of the animal.

The mandible (fig. 86a) bears no palp, the incisor process is slender and ends in 4 small teeth, the molar process ends in a blunt knob and bears a row of spines in the distal part. The maxillula (fig. 86b) has the inner lacinia slender, the upper lacinia ends in some short spines and is slightly broadened near the base, the palp is distinct, it is not bilobed. The maxilla (fig. 86c) has the scaphognathite broad, the palp is well developed, no endites were observed in my specimen, but I am not

Fig. 86. *Platycaris latirostris* nov. gen. nov. spec. a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, third maxilliped; g, third pereiopod; h, first pleopod of male; i, second pleopod of male. a-f, h, i, × 60; g, × 24.

certain that they were not lost during the dissection. The first maxilliped (fig. 86d) is provided with a well developed bilobed epipod, the exopod is large and bears a broad caridean lobe, the palp is well developed, the basis and coxa are separated by a distinct notch. The second maxilliped (fig. 86e) is normal in shape, the exopod is well developed, the epipod is large, no podobranch is present. The third maxilliped (fig. 86f) almost reaches the end of the basal segment of the antennular peduncle, its last segment is ovate and bears some spinules at the inner margin, it is somewhat longer and more slender than the penultimate segment. The antepenultimate segment is about as

long as the last two segments together. The exopod is well developed, it reaches beyond the penultimate segment. An epipod and an arthrobranch are present.

The first pereiopod (figs. 85e, f) is rather robust, it reaches with the chela and a large part of the carpus beyond the scaphocerite. The fingers are unarmed, they are somewhat shorter than the palm and are provided with some tufts of setae. The carpus is distinctly longer than the chela, it slightly broadens anteriorly. The merus is stout, it is of the same length as the carpus. The ischium is short. The second pereiopods are lacking in my specimen. The last three pereiopods (fig. 86g) are rather short and stout. The dactylus is simple, strongly curved and ends in a pointed apex. The propodus is somewhat more than twice as long as the dactylus, it is about 4 times as long as broad. The carpus is short and broad, it is about half as long as the propodus. The merus is about as long as the propodus,but is distinctly broader. The posterior margin of the merus is broadly angularly produced in the distal part. The ischium is short.

The first pleopod of the male (fig. 86h) has the endopod oval in shape. The endopod of the second pleopod of the male (fig. 86i) has the appendix masculina short.

The uropods are much longer than the telson. The outer margin of the exopod is straight or slightly convex and ends in a movable spine. The exopod is broad and has the posterior margin rounded. The endopod is oval in shape and is slightly shorter than the exopod.

The species very much resembles *Coralliocaris brevirostris* Borr., but at once may be distinguished by the shape of the dactylus of the last three pereiopods. From the species of *Pontonia* and *Pontoniopsis,* genera to which it is most closely related, it differs at the first view by its very strongly depressed body and also by other characters, which are already pointed out at the end of the generic diagnosis.

Dasycaris Kemp, 1922

This genus, erected by K e m p for his new species *Dasycaris symbiotes,* is represented in the material at hand by a single specimen, which apparently belongs to a new species.

Dasycaris ceratops nov. spec. (figs. 87, 88)

Siboga Expedition

Station 80, Borneo Bank, 2° 25′ S, 117° 43′ E; trawl, Hensen quantitative net, vertical net (electric light in vertical net); depth from 50 to 40 m, quantitative net from 34 m to surface; bottom fine coralsand; June 13, 1899. — 1 ovigerous female 13 mm.

The rostrum is very slender, subulate, it reaches almost the end of the antennular peduncle; in the anterior part it is slightly curved upward. The upper margin of the rostrum is provided with one slender tooth in the basal part; the distal part of the upper margin and the entire lower margin bear no teeth. The carapace is areolated and greatly swollen posteriorly; in the upper median line the carapace is provided with four large compressed teeth; the posterior of these teeth is situated behind the middle of the carapace, the other three are placed rather close together in the anterior part of the carapace, forming a basal crest to the rostrum; the anterior tooth stands just over the orbit. The lower angle of the orbit is produced into an acute point, much below which the long and slender antennal

spine is situated. The hepatic spine, which is much smaller than the antennal, is placed behind it on about the same level. The anterolateral angle of the carapace is broadly rounded.

The abdominal segments like the carapace are more or less distinctly areolated. The pleurae of the first and second segments are broadly rounded. Those of the third to fifth segments are sharply pointed and provided with a longitudinal carina which ends into the point of the pleura. The pleurae of the second and third segments in my specimen probably are in a diseased condition at both sides: in the second segment the posterior half of the pleura shows a downwards produced lobe, which is of a much softer substance matter than the rest of the pleura. In the third segment the entire tip of the pleura is deformed to such a soft slightly swollen lobe; in this lobe the carina, which still is visible on the healthy part of the pleura, is entirely absent. The sixth abdominal segment is slightly more than $1^1/_2$ times as long as the fifth.

The telson (fig. 87c) is slightly less than $1^1/_2$ times as long as the sixth abdominal segment. The lateral margins of the telson are convex and slightly constricted behind the middle. The upper surface is rounded and provided with two pairs of strong spinules; the anterior pair of these spinules is situated in the middle of the telson, the other pair midway between the anterior pair and the posterior margin of the telson. This posterior margin bears three pairs of spinules, which are of about the same length, the outer pair being slightly shorter than the two inner pairs.

The eyes are well developed. The eyestalk is longer and broader than the cornea, it is swollen. The cornea is produced in the posterior half into a conical gibbosity, the rest of it is rounded. No ocellus could be observed.

The first segment of the antennular peduncle is very long and reaches beyond the middle of the scaphocerite. The stylocerite is slightly longer than $^1/_3$ of the length of the first segment, it is ovate and produced into a sharp point. The lateral margins of the first segment are constricted before the anterior margin; the anterolateral spine of this segment is strong and reaches beyond the middle of the third segment. The second segment is shorter than and about as broad as the third; together the two segments are somewhat more than half as long as the first. The upper antennular flagellum is broadened in the basal part; the shorter ramus is fused with the longer for 4 joints, the proximal of which is the longest; the free part of the shorter ramus consists of two joints and is less than half as long as the fused portion. Long hairs are present on the joints of the shorter ramus.

The scaphocerite reaches about to the end of the antennular peduncle. The outer margin is slightly concave and ends in a strong final tooth, which reaches to the end of the lamella. The lamella is broad, has the anterior margin rounded and is narrowed towards the base. The antennal peduncle is provided with a distinct spine.

The oral parts are figured here. The mandible (fig. 88a) is normal in shape, the molar process bears some rows of spinules. The maxillula (fig. 88b) has the inner lacinia slender, the palp is indistinctly bilobed. The endite of the maxilla (fig. 88c) is cleft, the scaphognathite is large but not very broad. Exopods are present on all maxillipeds. In the first maxilliped (fig. 88d) no notch is visible between basis and coxa, the caridean lobe of the exopod is well developed, the epipod is shallowly bilobed. The second maxilliped (fig. 88e) is normal in shape, no podobranch is visible. The third maxilliped reaches slightly beyond the antennal peduncle. The ultimate and penultimate segments have about the same length. The antepenultimate segment is much longer. The exopod reaches almost the end of the antepenultimate segment.

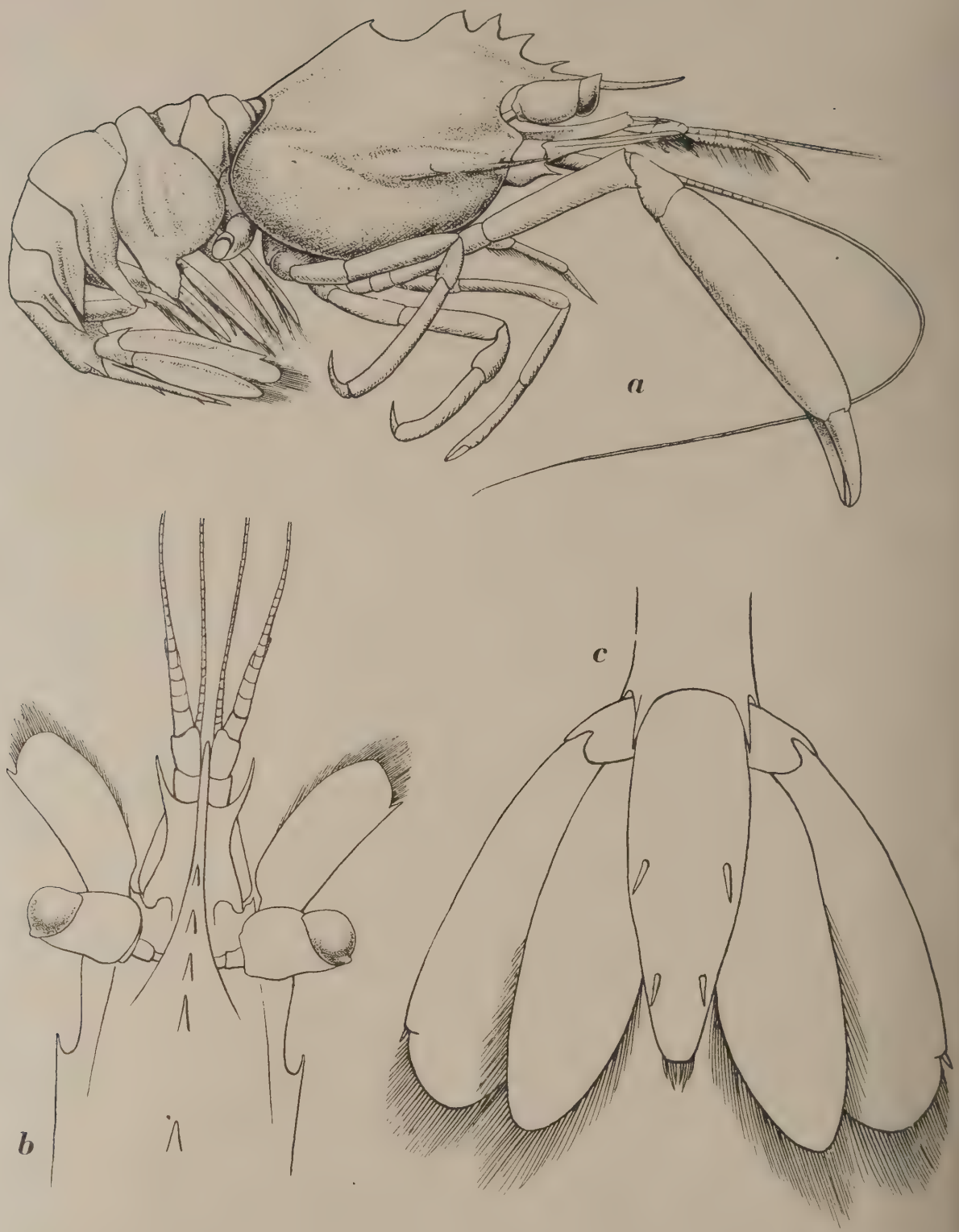


Fig. 87. *Dasycaris ceratops* nov. spec. a, animal in lateral view; b, anterior part of body, dorsal view; c, telson and uropods, dorsal view. a, × 14; b, × 20; c, × 40.

The first pereiopods are equal, they reach with the chela and part of the carpus beyond the scaphocerite. The chela is long and slender, the palm is fully twice as long as the fingers. The tips of the fingers are provided with tufts of setae. The carpus is longer than the palm, but shorter than the entire chela; it is of equal breadth throughout its length, being only suddenly narrowed at the base. The merus is about as long as the carpus and less than twice as long as the ischium. The second pereiopods are unequal, in my specimen the right leg is the stronger, it reaches with part of the carpus and the entire chela beyond the scaphocerite. The palm is more than twice as long as the fingers. The fingers have the tips crossing and both are provided with one tooth in the proximal part of the cutting

Fig. 88. *Dasycaris ceratops* nov. spec. a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, dactylus of fifth pereiopod. a-e, × 60.

edge; the tooth of the dactylus is placed behind that of the fixed finger, it is also more pointed than the lower tooth. The palm is cylindrical and slightly swollen. The carpus is very short, it measures less than 1/4 of the length of the palm, it is triangular in shape and has the anterior margin unarmed. The merus is 2 1/2 times as long as the carpus and possesses a tooth at the anterior end of the lower margin. The ischium is more than half as long as the merus. The left leg is less strong than the right and is much shorter, it only reaches with part of the chela beyond the scaphocerite. The fingers are unarmed and about half as long as the palm. The carpus is short, measuring 2/5 of the length of the palm, it is unarmed. The merus is twice as long as the carpus, it is unarmed. The following three pairs of pereiopods have the same shape, they are rather stout. The third leg reaches about to the end of the scaphocerite, the fifth fails to reach so far. The dactylus (fig. 88f) is strongly curved and ends in a sharp point, it possesses an indistinct angular process in the basal part of the posterior margin.

The propodus is curved and almost four times as long as the dactylus; the posterior margin of the propodus bears some spines and setae in the distal part. The carpus measures about $^1/_3$ of the length of the propodus and is as long as the ischium. The merus is twice as long as the carpus.

The uropods are longer than the telson. The outer margin of the exopod is distinctly convex, and ends in one tooth.

The present species is closely related to *Dasycaris symbiotes* Kemp, the only other species known of this genus. It shows the closest resemblance in the shape of the abdomen and the various appendages of thorax and abdomen. The only important differences between the two species are the much stronger teeth on the dorsal surface of the carapace in *D. ceratops* and the pointed corneae of the same species. Less important differences are shown in the shape of the dactylus of the last three pereiopods and in the arrangement of the spines on the dorsal surface of the telson. *Dasycaris symbiotes* is known to live in association with specimens of the pennatularian genus *Pteroeides*. Nothing is known of the biology of the present species.

Harpiliopsis Borradaile, 1917a

Definition: Pontoniid prawns associated with corals. Body strongly depressed. Rostrum compressed, provided with teeth. Carapace smooth, bearing antennal and hepatic spines.

Abdomen smooth. Pleurae of first three segments broadly rounded, those of the fourth and fifth segments produced in a sharp point. Sixth segment not very long. Telson elongate, with the upper surface provided with two, the posterior margin with three pairs of spines.

Eyes well developed, normal in shape. Cornea hemispherical.

Basal segment of antennular peduncle broad,stylocerite strong and pointed, anterolateral angle of the segment produced into a well developed spine. Last two segments of peduncle rather short. Upper antennular flagellum with the two rami fused for the larger part.

Scaphocerite large, but not very broad. Final tooth strong. Antennal peduncle with large external spine.

Mandible without palp, incisor process ending into three or more teeth, molar process provided with a row of spines. Maxillula with inner lacinia slender, upper lacinia normal in shape, palp with a very indistinct upper lobe. Maxilla with the endite simple or cleft, scaphognathite large and very broad. All maxillipeds with exopods. First maxilliped with the basis and coxa separated by a more or less distinct notch, palp short, caridean lobe of exopod very short and broad, epipod distinctly bilobed. Second maxilliped normal in shape, no podobranch present. Third maxilliped slender, epipod and arthrobranch present.

First pereiopods slender and unarmed. Second pereiopods equal in shape, heavy; ischium, merus and carpus with distinct anterior spines, palm elongate, fingers with some large teeth. Last three pereiopods rather stout, dactylus simple and strongly curved, no spines on any of the joints.

Endopod of first pleopod of male ovate, with the inner margin slightly concave. Appendix masculina in second pleopod of male shorter than appendix interna.

Uropods elongate, longer than telson.

Type: *Palaemon Beaupresii* Audouin.

The reasons for reestablishing Borradaile's genus *Harpiliopsis*, which was thought by

Kemp (1922) to be identical with *Harpilius* Dana, have already been pointed out above (p. 89), there also the differences between *Harpiliopsis* and the closely related forms have been dealt with.

The two species and the only variety of which the present genus consists, all are represented in the collections at hand. Only one of the species was known before from the Malay Archipelago.

Harpiliopsis beaupresi (Audouin) (fig. 89)

Without name Savigny, 1809, Descr. Égypte, atlas, Crust., pl. 10 fig. 4.
Palaemon Beaupresii Audouin, 1825, Descr. Égypte, Hist. nat., vol. 1 pt. 4, p. 91.
Palaemon Beaupresii Audouin, 1827, Descr. Égypte, ed. 2 vol. 22, p. 276, pl. 10 fig. 4.
Palemon Beaupresii P. Roux, 1831, Mém. Class. Crust. Salic., p. 16.
Harpilius Beaupresii Heller, 1861, Verh. zool.-bot. Ges. Wien, vol. 11, p. 27.
Harpilius Beaupresii Heller, 1862, S. B. Akad. Wiss. Wien, vol. 44 pt. 1, p. 280.
Harpilius Beaupresii Paulson, 1875, Invest. Crust. Red Sea, p. 113.
Pontonia (*Harpilius*) *dentata* Richters, 1880, Beitr. Meeresfauna Mauritius, p. 165, pl. 17 fig. 36-38.
Harpilius Beaupresii De Man, 1888, Arch. Naturgesch., vol. 53 pt. 1, p. 539.
Harpilius Beaupresii Nobili, 1901a, Annu. Mus. zool. Univ. Napoli, n. ser. vol. 1 pt. 3, p. 3.
Harpilius Beaupresii Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 63.
Harpilius Beaupresii Balss, 1915, Denkschr. Akad. Wiss. Wien, vol. 91 suppl., p. 26.
Harpiliopsis beaupresi Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 324, 379, pl. 55 fig. 21.
Harpilius beaupresi Tattersall, 1921, Journ. Linn. Soc. Lond. Zool., vol. 34, p. 389, pl. 28 fig. 8.
Harpilius beaupresi Kemp, 1922, Rec. Indian Mus., vol. 24, p. 229, figs. 67, 68.
Harpiliopsis beaupresi Edmondson, 1925, Bull. Bishop Mus. Honolulu, vol. 27, p. 7.
Harpilius beaupresi Kemp, 1925, Rec. Indian Mus., vol. 27, p. 327.
Harpilius beaupresii Balss, 1927, Trans. zool. Soc. Lond., vol. 22, p. 223.
Harpilius beaupresi Ramadan, 1936, Bull. Fac. Sci. Egypt Univ., vol. 6, p. 22.
Harpilius beaupresi Gurney, 1938, Sci. Rep. Great Barrier Reef Exped., vol. 6, pp. 18, 28, figs. 67-74, 123d.
Harpilius beaupresi Edmondson, 1946, Spec. Publ. Bishop Mus. Honolulu, vol. 22, p. 249.
Harpilius beaupresi Barnard, 1947, Ann. Mag. nat. Hist., ser. 11 vol. 13, p. 391.
Harpilius beaupresi Barnard, 1950, Ann. S. Afr. Mus., vol. 38, p. 797, fig. 151 f-h.

Siboga Expedition

Station 78, Lumulumu Shoal, Borneo Bank; reef; depth 34 m; June 10 and 11, 1899. — 4 specimens 9-14 mm.

Snellius Expedition

Kera near Timor; November 11-13, 1929. — 1 ovigerous female 13 mm.
Aloang, Paternoster Islands; reef; February 8, 1930. — 1 specimen 12 mm.

Museum Leiden:

Locality unknown. — 3 specimens (one of which an ovigerous female) 12-17 mm.

All features mentioned by Kemp (1922) for the present species are present in my material.

The oral parts of the present species partly have been figured by Gurney (1938, p. 27, fig. 123d). As is clear from Gurney's description and as is also confirmed by my material (fig. 89), the figures C and D representing the first maxilliped of respectively *Harpilius gerlachei* and *H. beaupresi*, have been interchanged in Gurney's paper. The oral parts of the present species

closely resemble those of *H. depressus*, the only important difference is that in the present species the endite of the maxilla is simple, while it is cleft in *H. depressus*.

I can not agree with Kemp's opinion that *Anchistia spinigera* Ortmann is identical with the present species. For a further discussion on this subject I refer to p. 184 under *Harpiliopsis depressus* var. *spinigerus* (Ortm.).

Fig. 89. *Harpiliopsis beaupresi* (Aud.) first maxilliped. × 36.

Distribution. This litoral species, which is associated with Madreporaria, is recorded in literature from: Red Sea (Heller, 1861, 1862; Paulson, 1875; Nobili, 1906b), Egypt (Savigny, 1809; Audouin, 1825, 1827), Suez Bay near Suez (Balss, 1927), Tor, Sinai Peninsula (Kemp, 1922), Ghardaqa, Red Sea (Ramadan, 1936; Gurney, 1938), Ras Abu Somer, Red Sea (Balss, 1915), Sherm Sheik, Africa (Balss, 1915), Daedalus Reef, Berenice, St. John Island (= Zebirget), Halaib, Jidda, Raveiya, and Kunfida, Red Sea (Balss, 1915), Suakin (Tattersall, 1921), Aqiq (Balss, 1915), Eritrea (Nobili, 1901a, 1906b), Massawa (Nobili, 1906b), Kamaran (Balss, 1915), Perim, Red Sea (Nobili, 1906b), Jibuti (Nobili, 1906b), Aden (Kemp, 1922), Delagoa Bay, S.E. Africa (Barnard, 1947, 1950), Fouquets, Mauritius (Richters, 1880), Mahé, Seychelles (Kemp, 1922), Coetivy, Seychelles (Borradaile, 1917a), Salomon Island, Chagos Archipelago (Borradaile, 1917a), Diego Garcia, Chagos Archipelago (Borradaile, 1917a), Goidu, Goifurfehendu Atoll, Maldive Archipelago (Borradaile, 1917a), Hulule, Male Atoll, Maldive Archipelago (Borradaile, 1917a), Port Blair, Andaman Islands (Kemp, 1922), Edam Island, Java Sea (De Man, 1888), French Frigate Shoals, Hawaiian Archipelago (Edmondson, 1925), Oahu, Hawaiian Archipelago (Kemp, 1925), Hawaii (Edmondson, 1946).

Harpiliopsis depressus (Stimpson) (fig. 90)

Harpilius depressus Stimpson, 1860, Proc. Acad. nat. Sci. Philad., 1860, p. 38.
Harpiliopsis depressus Holthuis, 1951a, Allan Hancock Found. Publ., Occ. Pap., vol. 11, p. 70, pl. 21 figs. a-i, pl. 22 figs. a-f (with complete synonymy).

Siboga Expedition

Station 78, Lumulumu Shoal, Borneo Bank; reef; depth 34 m; June 10 and 11, 1899. — 4 specimens 9-14 mm.

Station 79b, Kabaladua Island, Borneo Bank; reef; depth 22 m; June 12 and 13, 1899. — 1 specimen 17 mm.

Station 282, anchorage between Nusa Besi and the N.E. point of Timor, 8° 25′.2 S, 127° 18′.4 E; trawl, dredge and reef exploration; depth 27-54 m; bottom sand, coral and Lithothamnion; January 15-17, 1900. — 5 specimens (included ovigerous females) 12-14 mm.

Snellius Expedition

Maratua; reef; August 14-18, 1929. — 1 specimen 13 mm.

Kera near Timor; November 11-13, 1929. — 4 specimens (included ovigerous females) 15-17 mm.

Obi latu; shore and reef; April 23-27, 1930. — 4 specimens (included ovigerous females) 11-13 mm.

Museum Leiden

Locality unknown; Museum Godeffroy. — 2 specimens 10 and 13 mm.

Fig. 90. *Harpiliopsis depressus* (Stimps.), a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, first pleopod of male; g, second pleopod of male. a, b, × 56; c-e, × 28; f, g, × 75.

The present specimens agree in all respects with the characters mentioned by K e m p (1922).

The oral parts of the present species are figured here (figs. 90a-e), the most important features have already been mentioned in the definition of the genus. The present species differs from the preceding by having the endite of the maxilla bilobed.

Also the first two pleopods of the male are figured (figs. 90f, g). The endopod of the first pleopod shows a close resemblance to that of the males of the subgenus *Harpilius*.

Distribution. This litoral species is associated with Madreporaria. It has been recorded from *Porites* (Holthuis, 1951a) and *Pocillopora* (Edmondson, 1946; Holthuis, 1951a). Chace (1937) reported it from *Pocillopora ligulata* Dana. *Harpiliopsis depressus* has been recorded in literature from the following localities: Nawibi [= ? Nuebe], and Dahab [= ? Dhaba], Red Sea (Balss, 1915), Sherm Sheik, Sinai Peninsula (Balss, 1915), Sinafir Island, Red Sea (Balss, 1915), Ghardaqa (Ramadan, 1936), Ras Abu Somer (Balss, 1915), Sherm Sheik, African coast of Red Sea (Balss, 1915), Mersa Sheik (Holthuis, 1951a), St. John Island [= Zebirget] and Yenbo, Red Sea (Balss, 1915), Delagoa Bay, S.E. Africa (Barnard, 1947, 1950), Coetivy, Seychelles (Borradaile, 1917a), Isle du Coin, Peros Banhos Group, Chagos Archipelago (Borradaile, 1917a), Salomon Island, Chagos Archipelago (Borradaile, 1917a), Hulule, Male Atoll, Goidu, Goifurfehendu Atoll and Naifaro, Fadiffolu Atoll, Maldive Archipelago (Borradaile, 1917a), Madras (Kemp, 1922), Malay Archipelago (Holthuis, 1951a), Lifu, Loyalty Islands (Borradaile, 1898, 1899), Rotuma (Borradaile, 1898), Savaii, Samoa Islands (Armstrong, 1941), Wake Island (Edmondson, 1925), Ocean Island (Edmondson, 1924, 1925), Hawaiian Archipelago (Pesta, 1933), Laysan (Lenz, 1901; Edmondson, 1925), Oahu (Edmondson, 1925; Kemp, 1925; Holthuis, 1951a), Honolulu and Waikiki, Oahu (Rathbun, 1906), Molokai (Holthuis, 1951a), Hawaii (Stimpson, 1860; Edmondson, 1923, 1946; Holthuis, 1951a), Johnston Island (Edmondson, 1925), Palmyra (Edmondson, 1923), off Arena Bank, Lower California (Chace, 1937), Gulf of California, westcoast of Mexico, Costa Rica, Panama, and Colombia, Galapagos Islands (Holthuis, 1951a).

Harpiliopsis depressus (Stimpson) var. *spinigerus* (Ortmann)

Anchistia spinigera Ortmann, 1890, Zool. Jb. Syst., vol. 5, p. 511, pl. 36 fig. 23.
non *Periclimenes spinigerus* Borradaile, 1898, Proc. zool. Soc. Lond., 1898, p. 1004.
non *Periclimenes spinigerus* Borradaile,1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 383.
non *Periclimenes spinigerus* Borradaile, 1899, Willey's Zool. Res., vol. 4, p. 405.
non *Anchistia spinigera* Lenz, 1901, Zool. Jb. Syst., vol. 14, p. 434.
Harpilius depressus var. *gracilis* Kemp, 1922, Rec. Indian Mus., vol. 24, p. 234, fig. 71.

Snellius Expedition

Mamudju, Celebes; shore and reef; August 4 and 5, 1929. — 4 specimens (included ovigerous females) 16-17 mm.

Museum Leiden

Samoa; Museum Godeffroy. — 1 specimen 20 mm.

Kemp (1922) is inclined to consider *Anchistia spinigera* Ortmann to be identical with *Harpiliopsis beaupresi* because, as he states: "Both these authors [Ortmann (1890) and Lenz (1901)] refer to the presence of three spines at the distal end of the merus of the second leg and this character, so far as I am aware, occurs only in *H. beaupresi*." In his description of *H. beaupresi*

K e m p states: "The merus has a strong spine at the distal end of its upper border; the lower border ends in a sharp spine on the outer side and in a rounded lobe on the inner side." Furthermore K e m p says in the description of *H. depressus*: "The merus is closely similar to that of *H. beaupresi.*" It is therefore very probable that K e m p, when writing the first cited sentence, took the merus, described by O r t m a n n, for the ischium, because the ischium in *H. beaupresi* is provided with three, in *H. depressus* only with one anterior spine. The three spines at the anterior margin of the merus mentioned by O r t m a n n (1890) as well as by L e n z (1901) obviously are identical with the two spines and the one lobe mentioned by K e m p to be situated at the anterior margin of the merus in his specimens. That *Anchistia spinigera* is not identical with *H. beaupresi* is shown by the fact that the fingers of the second pereiopods in O r t m a n n's species have the tips not truncate like in *H. beaupresi* and furthermore by the fact that the carpus possesses only a ventral spine at the anterior margin and no dorsal spine ("der Merus besitzt am Ende drei Dornen, der Carpus nur einen am inneren Ende.") like in *H. depressus* and unlike *H. beaupresi.* A further argument that *Anchistia spinigera* is identical with *Harpiliopsis depressus* is the fact that the collection of the Rijksmuseum van Natuurlijke Historie at Leiden possesses a specimen of the genus *Harpiliopsis* from Samoa which was obtained from the Museum Godeffroy. This specimen exactly resembles the figure given by O r t m a n n of *Anchistia spinigera* and entirely agrees with O r t m a n n's description. O r t m a n n's specimen now also originates from Samoa and too has been purchased by the Strasbourg Museum from the Museum Godeffroy. As now O r t m a n n's description agrees with *Harpiliopsis depressus* and since the specimen of the Leiden Museum from Samoa shows to belong also to *H. depressus,* there is no doubt about the identity of O r t m a n n's species. (A similar case in which the Leiden and the Strasbourg Museum purchased from the Museum Godeffroy specimens of the same species from the same locality is presented by the types of *Hetairocaris orientalis* De Man (1890), which species was described by O r t m a n n (1890) as *Hippolyte ponapensis*). When comparing the Samoa specimen at hand with K e m p's (1922, p. 234) table for distinguishing *Harpiliopsis depressus* s.s. from its variety *gracilis* Kemp, it becomes obvious that the specimen from Samoa belongs to the variety. Also the type specimen of O r t m a n n's *Anchistia spinigera* belongs to the variety of *H. depressus,* as is distinctly shown by O r t m a n n's figure. As the name *spinigera* Ortmann (1890) is published long before that of *gracilis* Kemp (1922), the present variety must be named *Harpiliopsis depressus* var. *spinigerus* (Ortmann).

Distribution. The variety is recorded in literature from the Andaman Islands (K e m p, 1922) and from Samoa (O r t m a n n, 1890).

Coralliocaris Stimpson, 1860

Many of the species inserted by B o r r a d a i l e (1917a) in the genus *Coralliocaris* must be removed from it; so for instance the subgenus *Onycocaris* has to be elevated to the rank of a genus; it is even not very closely related to *Coralliocaris*; furthermore the species *Coralliocaris atlantica, C. hecate, C. quadridentata, C. rhodope,* and *C. truncata* have to be placed in the genus *Periclimenaeus.* For *Coralliocaris lucina* a new genus is erected here (vid. p. 191). K e m p (1922) gave a key to the species of *Coralliocaris* examined by him; these species are *C. graminea, C. superba, C. venusta* and *C. lucina.* With certainty the following species also may be included in the present genus: *C. brevi-*

rostris Borradaile, *C. macrophthalma* (H. Milne Edw.), *C. nudirostris* (Heller) and *C. tahitoei* Boone, the latter species being, however, identical with *C. nudirostris*. *Coralliocaris camerani* Nobili proved to be identical with *Pontonia margarita* Smith. In 1931 Edmondson described a new species as *Coralliocaris mammillata*. This species lives on an Echinoid (*Heterocentrotus mammillatus* (L.)). When comparing Edmondson's description and figures with specimens of *Gnathophylloides mineri* Schmitt, from Jamaica, which were found to live on Echinoids too, I found such a very close resemblance between the two species, that I have no doubt that *Coralliocaris mammillata* belongs in the genus *Gnathophylloides* and thus is no Pontonid, but a member of the family Gnathophyllidae. Unfortunately Edmondson does not figure nor describe the mandible in his species. Examination of the type for this character is very desirable, since in *Gnatophylloides* the mandible lacks the incisor process. The following species described as new forms of *Coralliocaris* since the publication of Borradaile's monograph must be inserted in the genus *Periclimenaeus*: *Coralliocaris perlatus* Boone, *C. pearsei* Schmitt, and *C. wilsoni* Hay.

The oral parts of the various species of the present genus examined by me do not show large differences. The mandible has the incisor process slender and ending in 4 or 5 teeth, the molar process is somewhat stronger and bears at the top a large number of spines. The maxillula has the inner lacinia slender, the palp is indistinctly bilobed. The maxilla has the scaphognathite broad, the palp is distinct and the endite is simple or ends in two short blunt lobes. The first maxilliped has the exopod very strong with a broad caridean lobe; the epipod is distinct and bilobed, the coxa and basis are separated by a small notch. The second maxilliped is quite normal in shape, it shows no essential differences from those of *Periclimenes*, the epipod is well developed, no podobranch is present. The third maxilliped has its joints rather short and broad, the propodus bears very many hairs at its inner margin, the exopod is well developed and reaches almost the end of the dactylus, an arthrobranch is present.

In the collections at hand four species are represented; three of them have already been recorded previously from the Malay Archipelago. One species recorded in literature from the Malay Archipelago is not present in the collections studied.

Coralliocaris graminea (Dana) (fig. 91)

Oedipus gramineus Dana, 1852, Proc. Acad. nat. Sci. Philad., vol. 6, p. 25.
Oedipus gramineus Dana, 1852a, U.S. Explor. Exped., vol. 13, p. 574.
Oedipus gramineus Weitenweber, 1854, Lotos Praha, vol. 4, p. 37.
Oedipus gramineus Dana, 1855, U.S. Explor. Exped., vol. 13 atlas, p. 12, pl. 37 fig. 3.
Coralliocaris graminea Stimpson, 1860, Proc. Acad. nat. Sci. Philad., 1860, p. 38.
Coralliocaris graminea Miers, 1884, Rep. zool. Coll. Alert, p. 563.
Coralliocaris graminea De Man, 1888, Arch. Naturgesch., vol. 53 pt. 1, p. 536.
Oedipus gramineus var. Pfeffer, 1889, Jb. Hamb. wiss. Anst., vol. 6 pt. 2, p. 34.
Coralliocaris inaequalis Ortmann, 1890, Zool. Jb. Syst., vol. 5, p. 510, pl. 36 fig. 21.
Coralliocaris graminea Ortmann, 1894, Denkschr. med. naturw. Ges. Jena, vol. 8, p. 16.
Coralliocaris graminea Borradaile, 1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 385.
Coralliocaris inaequalis Borradaile, 1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 386.
Coralliocaris inaequalis Borradaile, 1899, Willey's Zool. Res., vol. 4, p. 408.
Coralliocaris graminea De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 840.
Coralliocaris graminea Lenz, 1905, Abh. Senckenb. naturf. Ges., vol. 27, p. 381.

Coralliocaris graminea Calman, 1909, Proc. zool. Soc. Lond., 1909, p. 706.
Coralliocaris inaequalis Balss, 1914, Abh. Bayer. Akad. Wiss., suppl. vol. 2 pt. 10, p. 53.
Coralliocaris graminea Balss, 1915, Denkschr. Akad. Wiss. Wien, vol. 91 suppl., p. 26.
Coralliocaris graminia Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 324.
Coralliocaris graminea Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 383.
Coralliocaris inaequalis Urita, 1921, Zool. Mag. Tokyo, vol. 33, p. 217.
Coralliocaris graminea Kemp, 1922, Rec. Indian Mus., vol. 24, p. 269, figs. 96, 97.
Coralliocaris graminea Edmondson, 1923, Bull. Bishop Mus. Honolulu, n. 5, p. 34.
Coralliocaris graminea Balss, 1925, Wiss. Ergebn. Valdivia Exped., vol. 20, p. 294.
Coralliocaris graminea Edmondson, 1925, Bull. Bishop Mus. Honolulu, n. 27, p. 7.
Coralliocaris graminea Kemp, 1925, Rec. Indian Mus., vol. 27, p. 322.
Coralliocaris graminea Boone, 1935, Bull. Vanderbilt mar. Mus., vol. 6, p. 176, pl. 48.
Coralliocaris graminea Ramadan, 1936, Bull. Fac. Sci. Egypt. Univ., vol. 6, p. 23.
Coralliocaris graminea Yu, 1936a, Chin. Journ. Zool., vol. 2, p. 92.
Coralliocaris graminea Gurney, 1938, Sci. Rep. Great Barrier Reef Exped., vol. 6, p. 20, figs. 81-89.
Coralliocaris graminea Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 70, figs. 33-35.
Coralliocaris graminea Armstrong, 1941, Amer. Mus. Novit., n. 1137, p. 13.
Coralliocaris graminea Barnard, 1950, Ann. S. Afr. Mus., vol. 38, p. 800.

Siboga Expedition

Station 34, anchorage off Labuhanpandan, Lombok; shore exploration; depth 18 m; bottom coral reef; March 27, 1899. — 1 specimen 15 mm.

Station 79b, Kabaladua Island, Borneo Bank; reef; depth 22 m; bottom coral sand; June 12 and 13, 1899. — 2 specimens 11 and 16 mm.

Station 91, Muaras Reef (inner side),eastcoast of Borneo; reef; depth up to 54 m; June 22, 1899. — 1 specimen 10 mm.

Station 213, Salajar anchorage and surroundings, including Pasitanete Island, near the northpoint of Salajar Island; reef; depth up to 36 m; September 26 till October 26, 1899. — 6 specimens (including ovigerous females) 14-16 mm.

Snellius Expedition

Kera near Timor; November 11-13, 1929. — 1 ovigerous female 15 mm.

Near Kupang, Timor; November 18-20, 1929. — 2 specimens 16 and 17 mm.

Gonto Sau, Spermonde Archipelago, near Makassar; shore; March 1, 1930. — 1 specimen 16 mm.

Obi latu; shore and reef; April 23-27, 1930. — 3 specimens (included ovigerous females) 13-16 mm.

Amboina; shore and reef; diver, 0-2 m; May 6, 1930. — 4 specimens (one of which an ovigerous female) 9-15 mm.

Ake Selaka, Kau Bay, Halmahera; shore and reef; May 28, 1930. — 1 specimen 18 mm.

Beo, Karakelong, Talaud Islands; 6-10 m; June 14-21, 1930. — 2 ovigerous females 12 and 16 mm.

Museum Leiden

Bay of Djakarta (= Batavia); 1927; leg. W. C. van Heurn. — 6 specimens (included ovigerous females) 12-23 mm.

Museum Amsterdam

Bay of Djakarta (= Batavia); leg. C. P. Sluiter. — 1 specimen 20 mm.

Edam Island, Java Sea; leg. J. Brock; coll. J. G. de Man. — 1 specimen 17 mm.

The oral parts of the present species are figured here (figs. 91a-e), the most important characters of these oral parts have already been mentioned in the general discussion of the genus.

The maxilla differs from that of *C. superba* by having the endite distinctly bilobed. The caridean lobe at the base of the exopod of the first maxilliped is rather angular. The main features of the third maxillipeds are already dealt with by K e m p (1922).

The endopod of the first pleopod in the male (fig. 91f) resembles that of species of *Harpilius*.

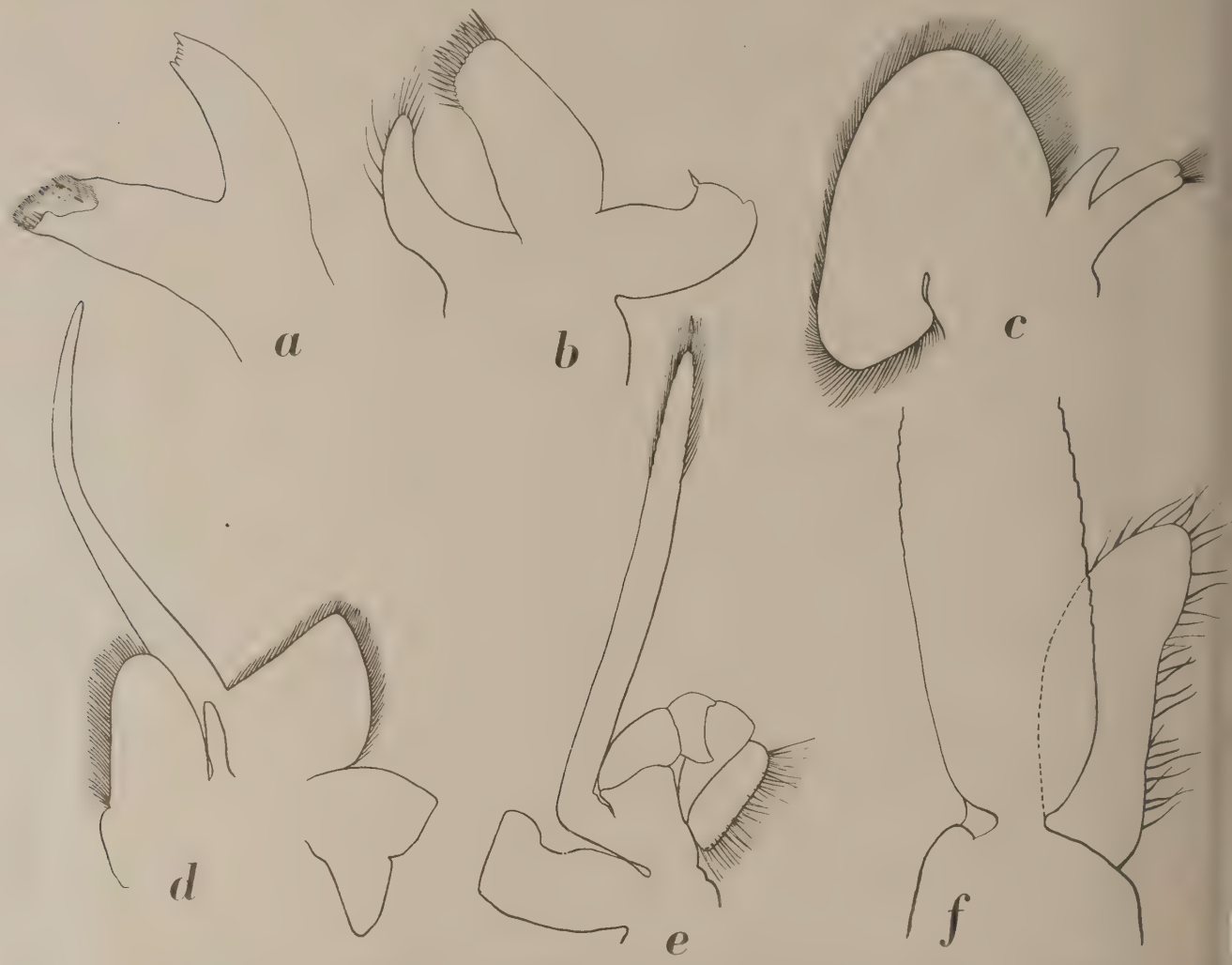


Fig. 91. *Coralliocaris graminea* (Dana). a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, endopod of first pleopod of male. a, b, f, × 56; c, × 28; d, e, × 22.

The specimens at my disposal agree well with K e m p's (1922) description. A specimen from Kupang had the rostrum provided with three dorsal teeth, the proximal of which is indistinct, while in a specimen from the Talaud Islands only two dorsal teeth are present, in all other characters these specimens agree with the other specimens of this species.

The specimen from Edam Island has already been mentioned by D e M a n (1888).

Distribution. The species is associated with madrepore corals. G u r n e y (1938) reports it to live among the branches of a *Stylophora* species. The records of this species in literature are: Suez (B a l s s, 1915), Ghardaqa, Red Sea (R a m a d a n, 1936; G u r n e y, 1938), Sinafir, El Qoseir Reef, Habban, St. John Island (= Zebirget), Yenbo, Raveiya, El Lith, and Massawa, Red Sea (B a l s s,

1915), Changu Reef, Zanzibar (Pfeffer, 1889), Upangu Reef, Dar es Salaam (Ortmann, 1894), Juan de Nova, Mozambique Canal (Lenz, 1905), Seychelles (Miers, 1884; Kemp, 1922), Mahé, Seychelles (Balss, 1925), Coetivy, Seychelles (Borradaile, 1917a), Pamban, Gulf of Manaar (Kemp, 1922), Port Blair, Andaman Islands (Kemp, 1922), Camorta Island, Nicobar Group (Kemp, 1925), Kagoshima, Japan (Ortmann, 1890; Urita, 1921), Ôsima, Riukiu Islands (Kubo, 1940), Okinawa, Riukiu Islands (Balss, 1915), Hongkong (Stimpson, 1860), Hainan, S. China (Yu, 1936), Pulo Condore, Indochina (Kemp, 1922), Ternate, Moluccas (De Man, 1902), Edam Island, Java Sea (De Man, 1888), Christmas Island (Calman, 1909), Falcon Island, Palm Islands, Queensland (Boone, 1935), South Sea (Kemp, 1922), New Caledonia (Kemp, 1922), Sandal Bay, Lifu, Loyalty Islands (Borradaile, 1898a, 1899), Rewa, Viti Levu, Fiji Islands (Dana, 1852), Samoa (Ortmann, 1890), Savaii, Samoa Islands (Armstrong, 1941), Wake Island (Edmondson, 1925), Johnston Island (Edmondson, 1925), Palmyra (Edmondson, 1923).

Coralliocaris superba (Dana) (fig. 92)

Oedipus superbus Dana, 1852, Proc. Acad. nat. Sci. Philad., vol. 6, p. 25.
Oedipus superbus Dana, 1852a, U.S. Explor. Exped., vol. 13, p. 573.
Oedipus superbus Weitenweber, 1854, Lotos Praha, vol. 4, p. 37.
Oedipus superbus Dana, 1855, U.S. Explor. Exped., vol. 13, atlas, p. 12, pl. 37 fig. 2.
Coralliocaris superba Stimpson, 1860, Proc. Acad. nat. Sci. Philad., 1860, p. 38.
Oedipus dentirostris Paulson, 1875, Invest. Crust. Red Sea, p. 112, pl. 14 fig. 7.
Coralliocaris superba De Man, 1888, Arch. Naturgesch., vol. 53 pt. 1, p. 536.
Coralliocaris superba Borradaile, 1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 385.
Coralliocaris superba Nobili, 1901a, Annu. Mus. zool. Univ. Napoli, n. ser. vol. 1 pt. 3, p. 3.
Coralliocaris superba Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 55.
Coralliocaris superba(?) Calman, 1909, Proc. zool. Soc. Lond., 1909, p. 706.
Coralliocaris superba Balss, 1914, Abh. Bayer. Akad. Wiss., suppl. vol. 2 pt. 10, p. 53.
Coralliocaris superba Balss, 1915, Denkschr. Akad. Wiss. Wien, vol. 91 suppl., p. 26.
Coralliocaris superba Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 383.
Coralliocaris superba Tattersall, 1921, Journ. Linn. Soc. Lond. Zool., vol. 34, p. 390.
Coralliocaris superba Kemp, 1922, Rec. Indian Mus., vol. 24, p. 272, figs. 98, 99.
Coralliocaris superba Kemp, 1925, Rec. Indian Mus., vol. 27, p. 322.
Coralliocaris superba Boone, 1935, Bull. Vanderbilt mar. Mus., vol. 6, p. 170, pl. 46.
Coralliocaris superba Ramadan, 1936, Bull. Fac. Sci. Egypt. Univ., vol. 6, p. 23.
Coralliocaris superba Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 67, figs. 30-32.
Coralliocaris superba Armstrong, 1941, Amer. Mus. Novit., n. 1137, p. 13.

Siboga Expedition

Station 91, Muaras Reef, inner side, eastcoast of Borneo; trawl and dredge; depth up to 54 m; bottom hard coral sand, coral at anchorage; June 22, 1899. — 1 specimen 16 mm.

Snellius Expedition

Sissie near Misool; shore and reef; October 6, 1929. — 2 specimens (one of which an ovigerous female) 14 and 18 mm.
Kera near Timor; November 11-13, 1929. — 1 ovigerous female 21 mm.

Ake Selaka, Kau Bay, Halmahera; shore and reef; May 28, 1930. — 4 specimens (including ovigerous females) 24-26 mm.
Obi latu; shore and reef; April 27, 1930. — 1 specimen 14 mm.

Museum Leiden

Samoa; 1887; Museum Godeffroy. — 1 specimen.
Locality unknown; Museum Godeffroy. — 1 specimen 18 mm.

Museum Amsterdam

Sinabang, Simalur, off the westcoast of Sumatra; February and March, 1913; leg. E. Jacobson. — 3 specimens 16-21 mm.
Bay of Djakarta (= Batavia); leg. C. P. Sluiter. — 1 specimen 21 mm.

Fig. 92. *Coralliocaris superba* (Dana). a, maxilla; b, first maxilliped. a, b, × 33.

The specimens agree well with K e m p's description and figures.

The mandible and the maxillula do not differ essentially from those of *C. graminea*. The maxilla (fig. 92a) has the endite simple, without a trace of a second lobe. The caridean process of the first maxilliped (fig. 92b) is rounded. The differences between the third maxilliped of the present species and that of *C. graminea* have already been pointed out by K e m p (1922).

The specimen from the Siboga Expedition is provided with a Bopyrid parasite under the abdomen.

Distribution. Like all other species of the present genus *C. superba* is known to live in association with Madrepore corals. In literature it is recorded from the following localities: Red Sea

(Paulson, 1875), Ghardaqa, Red Sea (Ramadan, 1936), Sinafir Island, Ras Abu Somer, El Qoseir Reef, and Habban, Red Sea (Balss, 1915), Sherm Sheik, Africa (Balss, 1915), Yenbo, Halaib, and El Lith, Red Sea (Balss, 1915), Khor Dongonab, Red Sea (Tattersall, 1921), Massawa, Red Sea (Nobili, 1901a), Sebejir Island, Red Sea (Balss, 1915), Jibuti (Nobili, 1906b), Port Blair, Andaman Islands (Kemp, 1922), Camorta Island, Nicobar Group (Kemp, 1925), Bonin Islands (Balss, 1914), Nankin-Hama, Haha Island, Bonin Islands (Kubo, 1940), Noordwachter and Edam Islands, Java Sea (De Man, 1888), Temukus Roads, Bali (Boone, 1935), Christmas Island ? (Calman, 1909), Savaii, Samoa Islands (Armstrong, 1941), Tongatabu, Tonga Islands (Dana, 1852), Tahiti, Society Islands (Stimpson, 1860), Venus Point Reef, Tahiti (Boone, 1935), Teviatoa Reef, Raiatea, Society Islands (Boone, 1935).

Coralliocaris venusta Kemp (fig. 93)

Coralliocaris venusta Kemp, 1922, Rec. Indian Mus., vol. 24, p. 274, figs. 100, 101.
Coralliocaris venusta Ramadan, 1936, Bull. Fac. Sci. Egypt. Univ., vol. 6, p. 23.
Coralliocaris venusta Armstrong, 1941, Amer. Mus. Novit., n. 1137, p. 13.

Fig. 93. *Coralliocaris venusta* Kemp. maxilla. × 33.

Siboga Expedition

Station 240, Banda anchorage; trawl, dredge and reef exploration; depth 9-36 m; bottom black sand, and coral, lithothamnion bank in 18-36 m; November 22 till December 1, 1899. — 1 specimen 9 mm.

Snellius Expedition

Kera near Timor; November 11-13, 1929. — 2 ovigerous females 15 and 16 mm.
Beo, Karakelong, Talaud Islands; 6-10 m; June 14-21, 1930. — 1 ovigerous female 11 mm.

The specimens agree well with Kemp's (1922) description and figures. The rostrum mostly bears two dorsal and one ventral tooth in my material, though specimens with only one dorsal tooth occur also.

In the oral parts the present species shows a very close resemblance to *Coralliocaris superba*. The maxilla (fig. 93), however, is intermediate between those of *C. superba* and *C. graminea*

as its endite is simple, but shows a faint trace of an upper lobe. The first maxilliped much resembles that of *C. graminea.* The third maxilliped is figured by Kemp (1922).

The specimen from Banda is damaged, but nevertheless could be brought with certainty to the present species.

Distribution. According to Kemp the species is associated with madrepore corals. In literature the species is recorded from Ghardaqa, Red Sea (Ramadan, 1936), from N.E. Tholayram Paar, Gulf of Manaar (Kemp, 1922), and from Savaii, Samoa Islands (Armstrong, 1941). The species now for the first time is reported from the Malay Archipelago.

Jocaste nov. gen.[1])

Definition: Pontoniid prawns living in association with corals. Body strongly depressed. Rostrum well developed, depressed, provided with teeth. Carapace smooth, provided with antennal and hepatic spines.

Abdomen rather slender. Pleurae of the first five segments broadly rounded.

Telson elongate; upper surface with two pairs of spinules, posterior margin with three pairs of spinules.

Eyes normal in shape, cornea hemispherical.

Basal segment of antennular peduncle broad, stylocerite long, rather slender; last two segments of antennular peduncle short. Upper antennular flagellum with two rami.

Scaphocerite rather slender, with a distinct final tooth.

Mandible without palp, incisor process slender, ending in about 5 teeth; molar process slightly stronger than incisor process, ending in a blunt apex and provided with spines near the top. The maxillula with the inner lacinia slender, upper lacinia somewhat broader, ending in distinct spines; palp well developed, with an indistinct upper lobe. Maxilla with the scaphognathite broad, the palp well developed, the inner lacinia in the only species slender and simple. All maxillipeds with distinct exopods. First maxilliped with the epipod distinct, bilobed; caridean process at base of exopod broad, exopod long and broad; no distinct notch between basis and coxa. Second maxilliped normal in shape, strongly resembling those of *Coralliocaris,* exopod with a strong curve near the base, epipod well developed, elongate, podobranch absent. Third maxilliped slender, all joints elongate, exopod well developed, epipod rather short, arthrobranch present.

First pereiopods extremely slender. Second pereiopods very unequal in shape and size; larger chela slender, fingers very much shorter than palm; chela of smaller leg shorter, fingers about as long as palm. Last three pereiopods rather short and broad, dactylus with large hoofshaped basal protuberance, resembling in this respect *Coralliocaris.*

Endopod of first pleopod of the male oval in shape, somewhat excavated at the inner margin (fig. 94g).

Type and only species: *Coralliocaris lucina* Nobili.

The type species of the present genus up to now has been considered to belong to *Coralliocaris* Stimps., it shows however, so many differences with the other species of *Coralliocaris*, that the erection of a separate genus in my opinion is justified. The most important differences between *Coralliocaris*

1) Jocaste, mother and wife of Oedipus.

and *Jocaste* are that *Jocaste* possesses a hepatic spine, that its third maxillipede is slender, and that the second pereiopods are strongly unequal in shape.

Jocaste lucina (Nobili) (fig. 94)

? *Coralliocaris lamellirostris* Stimpson, 1860, Proc. Acad. nat. Sci. Philad., 1860, p. 38.
? *Coralliocaris superba* var. *japonica* Ortmann, 1890, Zool. Jb. Syst., vol. 5, p. 509.
? *Coralliocaris superba* var. *japonica* Borradaile, 1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 385.
? *Coralliocaris lamellirostris* Borradaile, 1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 385.
Coralliocaris lucina Nobili, 1901a, Annu. Mus. zool. Univ. Napoli, n. ser. vol. 1 pt. 3, p. 5.
Coralliocaris lamellirostris De Man, 1902, Abh. Senckenb. naturf. Ges., vol. 25, p. 842, pl. 26 fig. 55.
Coralliocaris lucina Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 57.
? *Coralliocaris lamellirostris* Balss, 1914, Abh. Bayer. Akad. Wiss., suppl. vol. 2 pt. 10, p. 53.
Coralliocaris lucina Balss, 1915, Denkschr. Akad. Wiss. Wien, vol. 91 suppl., p. 26.
Coralliocaris japonica Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, pp. 324, 384, pl. 56 fig. 23.
Coralliocaris lucina Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 384.
Coralliocaris lucina Tattersall, 1921, Journ. Linn. Soc. Lond. Zool., vol. 34, p. 390.
? *Coralliocaris superta* Urita, 1921, Zool. Mag. Tokyo, vol. 33, p. 217.
Coralliocaris lucina Kemp, 1922, Rec. Indian Mus., vol. 24, p. 276, fig. 102.
Coralliocaris lucina Edmondson, 1923, Bull. Bishop Mus. Honolulu, n. 5, p. 34.
Coralliocaris lucina Edmondson, 1925, Bull. Bishop Mus. Honolulu, n. 27, p. 7.
Coralliocaris lucina Kemp, 1925, Rec. Indian Mus., vol. 27, p. 322.
Coralliocaris lamellirostris Boone, 1935, Bull. Vanderbilt mar. Mus., vol. 6, p. 174, pl. 47.
Coralliocaris lucina Armstrong, 1941, Amer. Mus. Novit., n. 1137, p. 13.
Coralliocaris lucina Barnard, 1947, Ann. Mag. nat. Hist., ser. 11 vol. 13, p. 392.
Coralliocaris lucina Barnard, 1950, Ann. S. Afr. Mus., vol. 38, p. 799, fig. 151 i-m.

Siboga Expedition

Station 79b, Kabala dua Island, Borneo Bank; reef; depth 22 m; bottom coralsand; June 12 and 13, 1899. — 2 specimens (included an ovigerous female) 12 and 18 mm.
Station 91, Muaras Reef (inner side), eastcoast of Borneo; reef; depth up to 54 m; June 22, 1899. — 7 specimens (included ovigerous females) 13-16 mm.
Station 213, Salajar anchorage and surroundings, including Pasitanete Island, near the north point of Salajar Island; reef; depth up to 36 m; September 26 till October 26, 1899. — 1 ovigerous female 14 mm.

Snellius Expedition

Maratua; reef; August 14-18, 1929. — 1 specimen 17 mm.
Kera near Timor; November 11-13, 1929. — 8 specimens (included ovigerous females) 14-18 mm.
Obi latu; shore and reef; April 23-27, 1930. — 1 ovigerous female 13 mm.

Museum Amsterdam

Mozambique; 1894; leg. M. Weber. — 1 specimen 15 mm.

Six syntypes of the present species, originating from Eritrea, have been examined by me in the Istituto e Museo di Zoologia della Università di Torino at Turin, Italy. In the Museo Civico di Storia

Naturale in Genoa there are also six specimens of this species; this material, however, is not provided with an indication of the locality.

The oral parts of *Jocaste lucina* are figured here (figs. 94a-f), their most important characters are given in the generic diagnosis.

As already remarked by Kemp (1922) *Coralliocaris lamellirostris* Stimpson perhaps is identical with the present species, but Stimpson's description is not sufficient to recognise the species, moreover there are some differences between the present species and the description of *C. lamellirostris.*

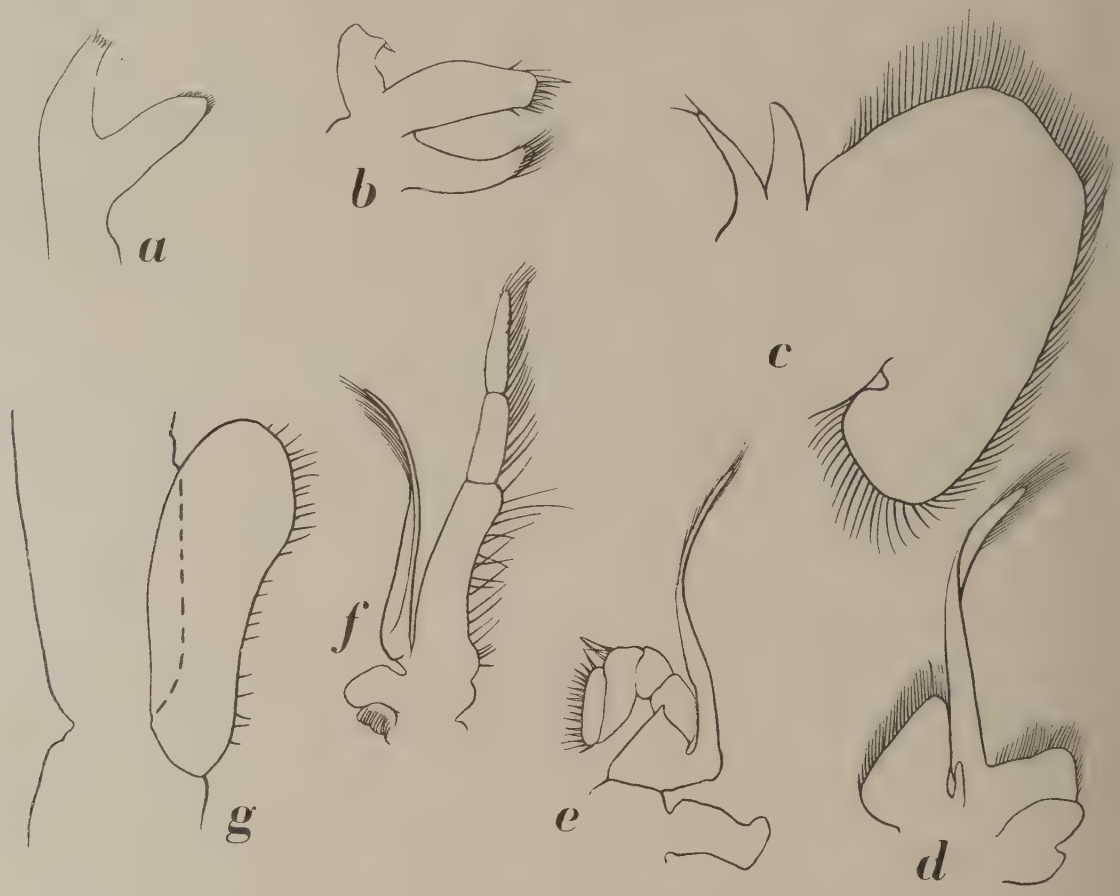


Fig. 94. *Jocaste lucina* (Nobili). a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, third maxilliped; g, first pleopod of male. a-c, g, × 60; d-f, × 30.

Also *Coralliocaris superba* var. *japonica* Ortmann probably is identical with *J. lucina,* Ortmann (1890), however, gives too few details to make this supposition certain. As Kemp pointed out, the specimens brought by Borradaile to Ortmann's variety, which is given by Borradaile the rank of a species, indeed belong to *Jocaste lucina.*

Distribution. Associated with Madreporaria. The records in literature are: Red Sea (Nobili, 1906b; Kemp, 1922), Nawibi [= ? Nuebe, Gulf of Aqaba] (Balss, 1915), Sherm Sheik [= ? El Sherm] Sinai Peninsula (Balss, 1915), Sinafir Island, Ras Abu Somer, El Qoseir Reef, Habban, St. John Island (= Zebirget), Yenbo, Halaib, Jidda, and Raveiya, Red Sea (Balss,

1915), Khor Dongonab, Red Sea (Tattersall, 1921), Eritrea (Nobili, 1901a, 1906b), Massawa, Eritrea (Nobili, 1906b; Balss, 1915), Anfila, Red Sea (Balss, 1915), Jibuti (Nobili, 1906b), Delagoa Bay, S.E. Africa (Barnard, 1947, 1950), Coetivy, Seychelles (Borradaile, 1917a), Saya de Malha Bank (Borradaile, 1917a), Isle du Coin, Peros Banhos Group, Chagos Archipelago (Borradaile, 1917a), Salomon Island, Chagos Archipelago (Borradaile, 1917a), Hulule, Male Atoll, Maldive Archipelago (Borradaile, 1917a), Cheval Paar, Ceylon (Kemp, 1922), Port Blair, Andaman Islands (Kemp, 1922), Ruthland Island, Andaman Islands (Kemp, 1922), Camorta Island, Nicobar Islands (Kemp, 1925), Kagoshima, Japan ? (Ortmann, 1890; Urita, 1921), Riukiu Archipelago ? (Stimpson, 1860), Ternate, Moluccas (De Man, 1902), Savaii, Samoa Islands (Armstrong, 1941), Venus Point Reef, Tahiti (Boone, 1935), Wake Island (Edmondson, 1925), Johnston Island (Edmondson, 1925), Palmyra (Edmondson, 1923).

Conchodytes Peters, 1852

The present genus consists of four species, all of which have an Indo-Westpacific distribution. The species are *C. tridacnae* Peters, *C. nipponensis* (De Haan), *C. biunguiculatus* (Paulson) and *C. monodactylus* nov. spec. Kemp (1922) gave a key to the Indo-Westpacific species of *Conchodytes* known to him; in this key he separated *C. tridacnae* from *C. meleagrinae,* while these two species are considered here to be identical. Only one species of the present genus has been recorded from Indonesia, namely *C. tridacnae.* In the collections at hand three species are represented. The type specimen of the fourth species, *C. nipponensis,* described by De Haan, is no longer extant in the Rijksmuseum van Natuurlijke Historie at Leiden.

The mandible possesses a slender incisor process, which ends in about 5 teeth, the molar process is excavated anteriorly and bears several blunt knobs and a circular row of spinules. The maxillula has both upper and inner laciniae strongly broadened and provided with many hairs and spines, the palp is well developed and may or may not be bilobed at the top. The maxilla has the scaphognathite long and not very broad, the palp is well developed, the inner lacinia is broad and uncleft. Exopods are present on all maxillipeds. The first maxilliped has the epipod well developed and more or less distinctly bilobed, the caridean process at the base of the exopod is much longer than broad, the palp is well developed, the basis and coxa are not separated by a notch. The second maxilliped is of the usual shape, the epipod is well developed, no podobranch is present. The third maxilliped without arthrobranch.

Conchodytes tridacnae Peters (fig. 95)

Conchodytes tridacnae Peters, 1852, Ber. Verh. Akad. Wiss. Berlin, 1852, p. 594.
Conchodytes meleagrinae Peters, 1852, Ber. Verh. Akad. Wiss. Berlin, 1852, p. 594.
Conchodytes Tridacnae Peters, 1852a, Arch. Naturgesch., vol. 18 pt. 1, p. 288.
Conchodytes meleagrinae Peters, 1852a, Arch. Naturgesch., vol. 18 pt. 1, p. 289.
Pontonia Tridacnae Dana, 1852, Proc. Acad. nat. Sci. Philad., vol. 6, p. 24.
Pontonia Tridacnae Dana, 1852a, U.S. Explor. Exped., vol. 13, p. 571.
Pontonia Tridacne Weitenweber, 1854, Lotos Praha, vol. 4, p. 37.
Pontonia Tridacnae Dana, 1855, U.S. Explor. Exped., vol. 13 atlas, p. 12, pl. 37 fig. 1.

Conchodytes Tridacnae Hilgendorf, 1879, Mber. Akad. Wiss. Berlin, 1878, p. 835.
Conchodytes Meleagrinae Hilgendorf, 1879, Mber. Akad. Wiss. Berlin, 1878, p. 836.
? *Pontonia* (*Conchodytes*) *tridacnae* p.p. Miers, 1884, Rep. zool. Coll. Alert, p. 290.
Pontonia meleagrinae Bate, 1888, Rep. Voy. Challenger, Zool., vol. 24, p. 707, pl. 124 figs. 1, 2.
Pontonia tridacnae Ortmann, 1890, Zool. Jb. Syst., vol. 5, p. 509, pl. 37 fig. 10.
? *Pontonia tridacnae* Henderson, 1893, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 5, p. 438.
? *Pontonia tridacnae* Thurston, 1895, Bull. Madras Govt. Mus., vol. 3, p. 120.
Conchodytes meleagrinae Borradaile, 1898, Proc. zool. Soc. Lond., 1898, p. 1007.
Conchodytes tridacnae Borradaile, 1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 390.
Conchodytes meleagrinae Borradaile, 1898a, Ann. Mag. nat. Hist., ser. 7 vol. 2, p. 390.
Conchodytes meleagrinae Borradaile, 1899, Willey's Zool. Res., vol. 4, p. 409.
Conchodytes tridacnae Nobili, 1899, Ann. Mus. Stor. nat. Genova, vol. 40, p. 235.
Pontonia meleagrinae Thompson, 1901, Catal. Crust. Mus. Dundee, p. 19.
? *Conchodytes meleagrinae* Pearson, 1905, Rep. Ceylon Pearl Oyster Fish., vol. 4, p. 77.
? *Conchodytes meleagrinae* p.p. Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 66, pl. 3 fig. 5.
Conchodytes tridacnae Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 66.
Conchodytes meleagrinae Nobili, 1907, Mem. Accad. Sci. Torino, ser. 2 vol. 57, p. 359.
? *Conchodytes meleagrinae* p.p. Balss, 1915, Denkschr. Akad. Wiss. Wien, vol. 91 suppl., p. 31.
Conchodytes tridacnae Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, pp. 324, 393.
Conchodytes meleagrinae Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, pp. 324, 393, pl. 57 fig. 26.
Conchodytes meleagrinae Balss, 1921, K. Svenska Vetensk. Akad. Handl., vol. 61 pt. 10, p. 15.
Conchodytes meleagrinae Tattersall, 1921, Journ. Linn. Soc. Lond. Zool., vol. 34, p. 392.
Conchodytes tridacnae Kemp, 1922, Rec. Indian Mus., vol. 24, p. 283, fig. 105.
Conchodytes meleagrinae Kemp, 1922, Rec. Indian Mus., vol. 24, p. 285.
Pontonia tridacnae Sendler, 1923, Abh. Senckenb. naturf. Ges., vol. 38, p. 46.
Conchodytes meleagrinae Edmondson, 1925, Bull. Bishop Mus. Honolulu, n. 27, p. 8.
Pontonia tridacnae McNeill, 1926, Aust. Zool., vol. 4, p. 300.
Conchodytes tridacnae Chopra, 1931, Rec. Indian Mus., vol. 33, p. 306.
Conchodytes meleagrinae Pesta,1933, Zool. Anz., vol. 104, p. 279.
Conchodytes biunguiculatus Boone, 1935, Bull. Vanderbilt mar. Mus., vol. 6, p. 184, pl. 50.
Conchodytes meleagrinae Ramadan, 1936, Bull. Fac. Sci. Egypt. Univ., vol. 6, p. 23.
Conchodytes meleagrinae Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 58, figs. 24, 25.
Conchodytes tridacnae Kubo, 1940, Journ. Imp. Fish. Inst. Tokyo, vol. 34, p. 62, figs. 26, 27.
Conchodytes tridacnae Armstrong, 1941, Amer. Mus. Novit., n. 1137, p. 13.
Conchodytes meleagrinae Armstrong, 1941, Amer. Mus. Novit., n. 1137, p. 13.
Conchodytes meleagrinae Vatova, 1943, Thalassia, vol. 6 pt. 2, p. 15.
Conchodytes meleagrinae Edmondson, 1946, Spec. Publ. Bishop Mus. Honolulu, vol. 22, p. 250, fig. 151.
Conchodytes tridacnae Barnard, 1950, Ann. S. Afr. Mus., vol. 38, p. 801.
Conchodytes meleagrinae Barnard, 1950, Ann. S. Afr. Mus., vol. 38, p. 801, fig. 151 n, o.

Siboga Expedition

Station 273, Djedan Island, eastcoast of Aru Islands; pearlbanks; in *Pteria* spec.; trawl, dredge and divers; depth 13 m; bottom sand and shells; December 23-26, 1899. — 29 specimens (including ovigerous females) 13-30 mm.

Snellius Expedition

Obi latu; shore and reef; April 23-27, 1930. — 1 specimen 22 mm.

The oral parts of the present species have already been figured by Borradaile (1917a).

The endopod of the first pleopod of the male (fig. 95) shows no essential differences from that of the species belonging to the subgenus *Harpilius* of the genus *Periclimenes*. The appendix masculina of the second pleopod of the male is much shorter than the appendix interna.

According to Kemp (1922) *Conchodytes tridacnae* and *C. meleagrinae* differ in the following respects:

1. The rostrum in *C. meleagrinae* does not reach the end of the antennular peduncle, while in *C. tridacnae* it reaches beyond the peduncle.
2. The carpus of the first pereiopod in *C. meleagrinae* is conspicuously shorter than the merus, while these joints are of the same length in *C. tridacnae*, in which species sometimes even the merus is shorter than the carpus.

Fig. 95. *Conchodytes tridacnae* Peters. endopod of first pleopod of male. × 80.

3. The anterolateral angle of the basal segment of the antennular peduncle is rounded in *C. tridacnae*, acute in *C. meleagrinae*.
4. In *C. tridacnae* the penultimate segment of the third maxilliped is considerably longer than the ultimate, they are about equal in length in *C. meleagrinae*.
5. The merus of the third pereiopod in *C. tridacnae* is 2.5 to 3 times as long as wide and the propodus 2.75 to 3 times, while these relations in *C. meleagrinae* are respectively 3.2 to 3.5 and 3.5 to 4.3.
6. The dorsal spines of the telson in *C. meleagrinae* are longer than in *C. tridacnae*. Furthermore in *C. tridacnae* the distance between the posterior pair of spines on the telson and the posterior margin is $^1/_3$ to $^1/_4$ of the distance between the two pairs of spines, while it is slightly more than half that distance in *C. meleagrinae*.

These characters in my material prove to have no constant relation. The rostrum in some specimens barely reaches the end of the second segment of the antennular peduncle, in others it reaches distinctly beyond the end of the third segment, but all transitions occur. Furthermore the

carpus of the first pereiopod varies from being shorter to being longer than the merus and also the ultimate segment of the third maxilliped sometimes is shorter and sometimes longer than the penultimate segment. There is, however, no constant relation at all between the length of the rostrum, that of the carpus of the first pereiopod and that of the ultimate segment of the third maxilliped, these characters vary independantly of each other. The anterolateral angle of the basal segment of the antennular peduncle in my material never is acute, in the specimen of the Snellius Expedition it is rather more narrow and longer than in the other material, but it always has the apex rounded. In my material the relation between the length and the breadth of the propodus of the third pereiopod varies between 3.8 and 4.7, while that relation in the merus varies between 2.7 and 3.3. The propodus in my specimens therefore shows most resemblance to that of K e m p's specimens of *C. meleagrinae*, being even generally more slender. The merus in my specimens on the contrary resembles most those of K e m p's specimens of *C. tridacnae*. The distance between the last pair of dorsal spines of the telson and the posterior margin of the telson is $^1/_2$ to $^2/_5$ of the distance between the two dorsal pairs of spines in my material, resembling thereby mostly K e m p's *C. meleagrinae* specimens; this character, as already pointed out by K e m p himself, is rather variable. In my opinion the above investigations show that the two species can not be kept separate and have to be united, a fact already thought possible by K e m p (1922).

Conchodytes biunguiculatus described by B o o n e (1935) belongs to the present species, as is distinctly shown by the description and figure given by B o o n e: the tubercle of the basal part of the dactylus of the last three legs namely is evenly rounded and shows no trace of the acute point present in *C. biunguiculatus*, moreover the fact that the specimen inhabited a species of *Pteria* (= *Meleagrina*) confirms the identity of B o o n e's specimen with the present species.

The specimen of this species from Mefoor (= Noemfoor), N.W. New Guinea, mentioned by N o b i l i, 1899, is still present in the collection of the Museo Civico di Storia Naturale in Genoa, Italy and was there examined by me.

B o r r a d a i l e (1898a, 1917a) in his references to the literature of both *C. tridacnae* and *C. meleagrinae* refers to "Ges. naturf. Freunde Berlin, 1851 (fide Hilgendorf)". H i l g e n d o r f (1879) under *C. Tridacnae* makes the remark "Original-Exemplar der Art und Gattung, welche 1851 (Ges. Naturforsch. Freunde, Berlin 18. Febr.) aufgestellt wurde." Now it appears that P e t e r s in the session of the 18th February, 1851 has demonstrated his shrimps and given them the generic name *Conchodytes*; the report of this session was not published before 1912, when the "Sitzungsberichte der Gesellschaft naturforschender Freunde zu Berlin" for 1839-1859 were issued in one paper; on p. 98 of this paper the report of the session of February 18, 1851 is published, in which P e t e r s mentions the genus *Conchodytes* without describing it and without naming the two species. B o r r a d a i l e (1898a, 1917a) is wrong therefore in giving 1851 as date of publication of both *C. tridacnae* and *C. meleagrinae*, as the first published description of the genus and the two species dates from 1852 (Ber. Verh. Akad. Wiss. Berlin, 1852).

Vertical distribution. The species is a litoral form and is associated with lamellibranchiate Mollusca. In literature it is recorded to be found in the following animals: "pearloyster" (? M i e r s, 1884; B a t e, 1888; N o b i l i, 1907; B a l s s, 1915, 1921; E d m o n d s o n, 1925), *Pteria* (= *Meleagrina*) spec. (N o b i l i, 1906b; B a l s s, 1915; B o r r a d a i l e, 1917a; K e m p, 1922; B o o n e, 1935), *Pteria* (= *Meleagrina* = *Pinctada*) *margaritifera* (L.) (P e t e r s, 1852; Kubo, 1940),

Tridacna spec. (Dana, 1852; Miers, 1884; Borradaile, 1917a; Kemp, 1922; Kubo, 1940), *Tridacna squamosa* Lam. (Peters, 1852). The specimens recorded in literature from *Pinna* spec. (Miers, 1884; Henderson, 1893; Thurston, 1895 [1]); Pearson, 1905; Nobili, 1906b; Balss, 1915) in all probability must be referred to *Conchodytes biunguiculatus* (Paulson). Chopra (1931) mentioned the find of this species in the cloaca of a Holothurian.

Horizontal distribution. The species is recorded in literature from the following localities: Red Sea (? Nobili, 1906b; Tattersall, 1921), Tor, Sinai Peninsula ? (Balss, 1915), Ghardaqa, Red Sea (Ramadan, 1936), Ras Abu Somer, and Hasani Island, Red Sea (Balss, 1915), Jidda (Hilgendorf, 1879), Massawa (Nobili, 1906b), Jibuti (Nobili, 1906b), Mogadishu, Benadir Coast, Italian Somaliland (Nobili, 1906b; Vatova, 1943), Ibo, northern Portuguese E. Africa (Peters, 1852; Hilgendorf, 1879), Farquhar, western Indian Ocean (Borradaile, 1917a), Salomon Island, Chagos Archipelago (Borradaile, 1917a), Hulule, Male Atoll, Maldive Archipelago (Borradaile, 1917a), Minikoi (Borradaile, 1917a), Cherbaniani Reef, Laccadive Archipelago (Kemp, 1922), Tuticorin and Rameswaram, S. India? (Henderson, 1893; Thurston, 1895), Cheval Paar? (Pearson, 1905), N.W. Cheval, Ceylon (Borradaile, 1917a), Andaman Islands (Kemp, 1922), Port Blair, Andaman Islands (Kemp, 1922), off Cinque Island, S. Andaman Island (Chopra, 1931), Isigaki, Riukiu Islands (Kubo, 1940), Haha and Titi, Bonin Islands (Kubo, 1940), Palau (Kubo, 1940), Mefoor (= Noemfoor), N.W. New Guinea (Nobili, 1899), N.W. Australia (Thompson, 1901), Cape Jaubert, N.W. Australia (Balss, 1921), Torres Straits (Bate, 1888; Kemp, 1922), Warrior Reef, Torres Straits (Miers, 1884), Keppel Island, near Port Curtis, Queensland ? (Miers, 1884), Northwest Islet, Capricorn Group, Queensland (McNeill, 1926), Kavieng, New Ireland (Sendler, 1923), Engineer Group and Conflict Group, off S.E. Papua (Borradaile, 1899), Matuku and Ngau, Fiji Archipelago (Miers, 1884), Suva, Viti Levu, Fiji Archipelago (Boone, 1935), Samoa Islands (Ortmann, 1890), Savaii, Samoa Islands (Armstrong, 1941), Upolu, Samoa Islands (Kemp, 1922), Tutuila, Samoa Islands (Dana, 1852), Penrhyn Island, Manihiki Group (Armstrong, 1941), Amanu and Rikitea, Tuamotu Archipelago (Nobili, 1907), Hawaiian Archipelago (Pesta, 1933), French Frigate Shoals, Hawaiian Archipelago (Edmondson, 1925), Hawaii (Edmondson, 1946).

Conchodytes biunguiculatus (Paulson)

Pontonia biunguiculata Paulson, 1875, Invest. Crust. Red Sea, p. 111, pl. 15 fig. 1.
? *Pontonia* (*Conchodytes*) *tridacnae* p.p. Miers, 1884, Rep. zool. Coll. Alert, p. 290.
? *Pontonia tridacnae* Henderson, 1893, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 5, p. 438.
? *Pontonia tridacnae* Thurston, 1895, Bull. Madras Govt. Mus., vol. 3, p. 120.
? *Conchodytes meleagrinae* Pearson, 1905, Rep. Ceylon Pearl Oyster Fish., vol. 4, p. 77.
? *Conchodytes meleagrinae* p.p. Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 66.
Conchodytes biunguiculatus Nobili, 1906b, Ann. Sci. nat. Zool., ser. 9 vol. 4, p. 67.
? *Conchodytes meleagrinae* p.p. Balss, 1915, Denkschr. Akad. Wiss. Wien, vol. 91 suppl. p. 31.
Conchodytes biunguiculatus Borradaile, 1917a, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 394.
Conchodytes biunguiculatus Kemp, 1922, Rec. Indian Mus., vol. 24, p. 280, fig. 103.
non *Conchodytes biunguiculatus* Boone, 1935, Bull. Vanderbilt mar. Mus., vol. 6, p. 184, pl. 50.

1) Thurston's specimens have already been mentioned by Henderson (1893).

Siboga Expedition

Station 303, Hansisi, Semau Island, Timor; dredge and reefexploration; depth 36 m; bottom lithothamnion; February 2-5, 1900. — 2 specimens 7 and 10 mm.

Museum Leiden

Takao, South Formosa; out of *Pinna* spec.; September 15, 1907; leg. H. Sauter. — 2 ovigerous females 31 and 47 mm.
Amboina; 1863; leg. D. J. Hoedt. — 1 specimen 32 mm.

The specimens agree well with Kemp's (1922) description and figure, only the juvenile specimens from Hansisi (Siboga Expedition) have the third maxilliped rather more slender than figured by Kemp.

The oral parts show no essential differences from those of the following species.

The specimen described and figured by Boone (1935) as *Conchodytes biunguiculatus* does not belong to that species, but distinctly shows to be *Conchodytes tridacnae* (cf. p. 198).

Vertical distribution. The species is a litoral form. Kemp (1922) records the species to be associated with *Pinna bicolor* Gmel. Specimens recorded in literature under the specific names *meleagrinae* and *tridacnae,* which inhabit molluscs of the genus *Pinna* (Miers, 1884; Henderson, 1893; Thurston, 1895 [1]); Pearson, 1905; Nobili, 1906b; Balss, 1915) in all probability must be referred to the present species.

Horizontal distribution. The species is recorded in literature from: Red Sea (Paulson, 1875; Nobili, 1906b), Tor, Sinai Peninsula ? (Balss, 1915), Tuticorin and Rameswaram, S. India ? (Henderson, 1893; Thurston, 1895), Cheval Paar, Ceylon ? (Pearson, 1905), Andaman Islands (Kemp, 1922), Port Blair, Andaman Islands (Kemp, 1922), Keppel Island, near Port Curtis, Queensland ? (Miers, 1884). Perhaps more specimens recorded in literature under the names *C. tridacnae* and *C. meleagrinae* will prove to belong to the present species.

Conchodytes monodactylus nov. spec. (figs. 96-98)

Museum Leiden

Takao, S. Formosa; out of *Pinna* spec.; September 15, 1907; leg. H. Sauter. — 3 specimens (including ovigerous females) 26-44 mm.

Museum Amsterdam

Lesser Sunda Islands; December 18, 1909; leg. H. J. M. Laurense. — 4 specimens (including ovigerous females) 20-38 mm.

The rostrum is broad and curved downward. It is narrowing gradually in the proximal half; in the distal half it tapers rapidly into a rounded apex, which reaches to the middle of the third segment of the antennular peduncle. The apex is broadly rounded in lateral view, narrowly rounded in dorsal view, the extreme apex is compressed, while the rest of the rostrum is depressed. No teeth

1) Thurston's specimens have already been mentioned by Henderson (1893).

are present on the rostrum. The carapace is smooth and swollen, the surface is minutely pitted and transversely grooved when examined with a lens. No spines are present on the carapace. The suborbital angle is blunt, the anterolateral angle of the carapace is produced forwards and is broadly rounded. At the level of the base of the scaphocerite a low carina runs backwards from the anterior margin of the carapace.

The abdomen is smooth, like in the carapace here also minute pits and transverse grooves are visible under strong magnification. The pleurae of the first five segments are broadly rounded, that of the sixth segment is triangular with a rounded apex. The posterolateral angles of the sixth

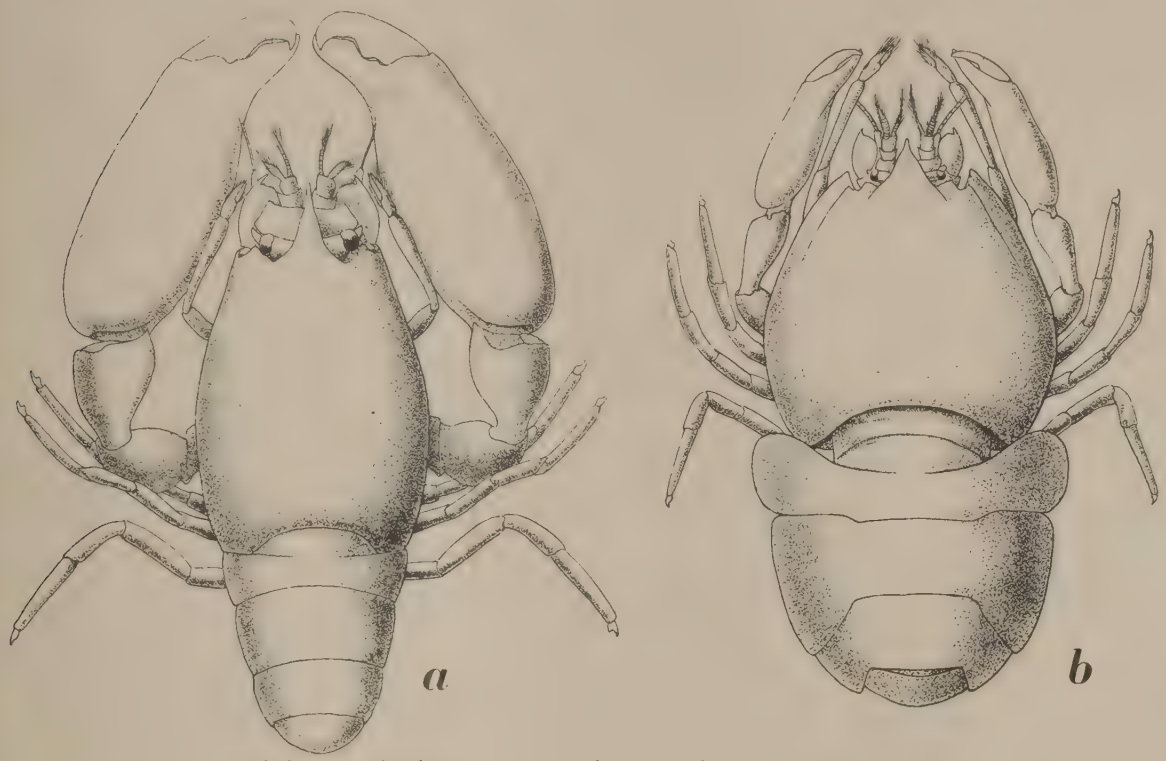


Fig. 96. *Conchodytes monodactylus* nov. spec. a, ♂, dorsal view; b, ♀, dorsal view. a, × 4.5; b, × 3.

abdominal segment are about rectangular, their tip is rounded. The sixth segment is slightly longer than the fifth.

The telson is about twice as long as the sixth abdominal segment, and almost twice as long as broad. The dorsal surface is provided with two pairs of strong spines. The first pair of these spines is placed very close to the anterior margin of the telson, the other pair is situated about midway between the first pair and the posterior margin of the telson. The posterior margin bears three pairs of spines: the outer pair is longest and placed much farther forward than the two other pairs, the intermediate pair is short and broad, almost leafshaped, the inner pair again is much narrower and slightly shorter than the intermediate pair. In one of the specimens four pairs of spines are present.

The eyes are rather small, the cornea is slightly narrower and distinctly shorter than the ophthalmic peduncle.

The first segment of the antennular peduncle is broad. The stylocerite is short and broad, it

is bluntly pointed and directed outward. The first antennular segment strongly broadens distally of the stylocerite. The outer anterior angle of the segment bears a small tooth, which is outreached by the convex anterior margin. The second segment is short, being much broader than long. The third segment is longer than the second. Together the second and third segments are more than half as long as the first. The upper antennular flagellum has the two rami thickened and fused for the first

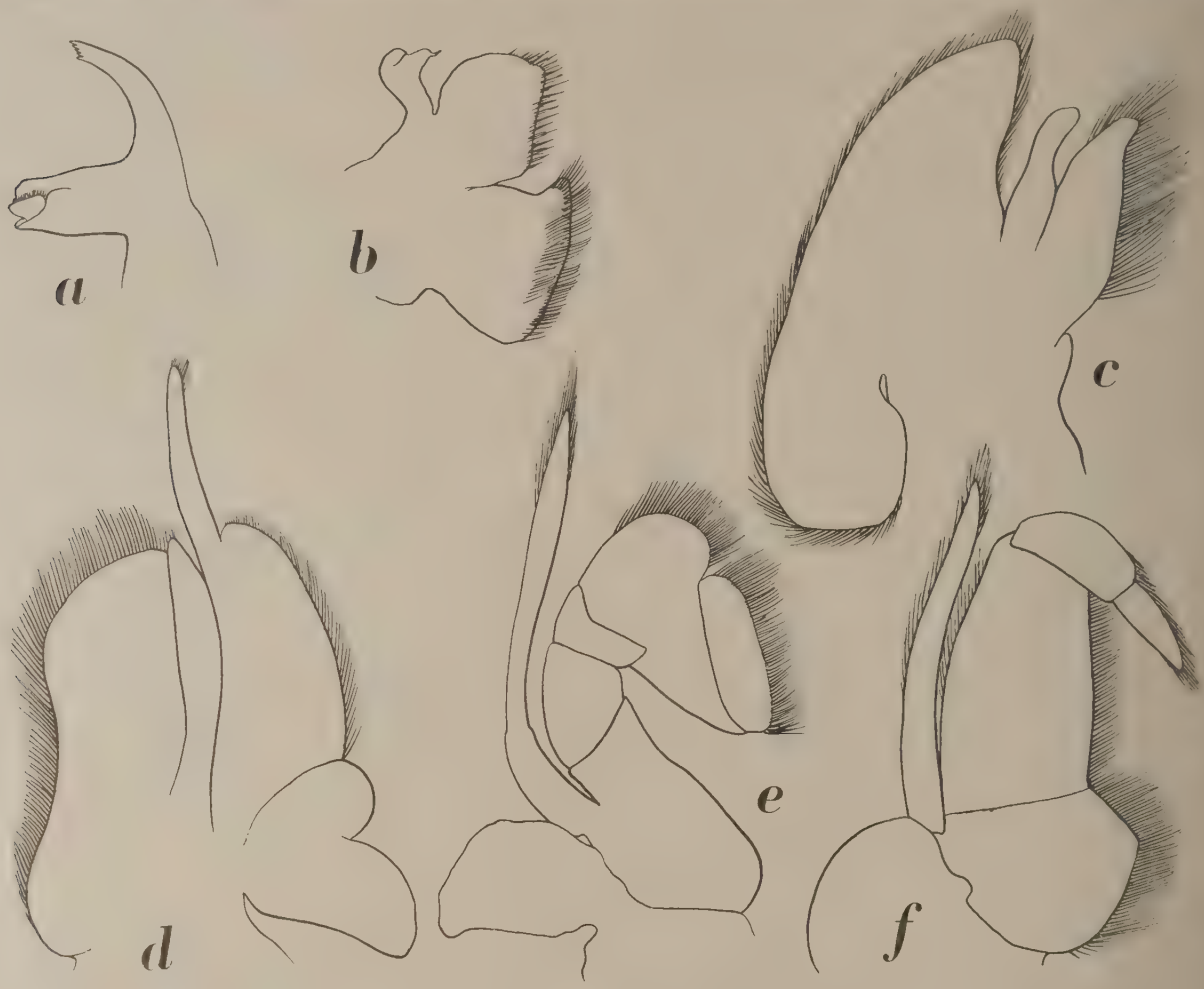


Fig. 97. *Conchodytes monodactylus* nov. spec. a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, third maxilliped. a-f, × 14.

five joints. The free part of the shorter ramus is extremely short, consisting of only one joint.

The scaphocerite reaches about to the end of the antennula. It is about 1.5 times as long as broad. The greatest breadth lies in the middle of the scale. The inner margin is circular, the outer margin convex, ending in a strong tooth, which overreaches the end of the lamella considerably. The last segment of the antennal peduncle is very long and reaches fully the end of the scaphocerite. No spine is present on the base of the antennal peduncle.

The oral parts are figured here (figs. 97a-f), they closely resemble those of *C. biunguiculatus*. The third maxilliped reaches to the end of the first segment of the antennular peduncle. The last two segments are subequal. The ultimate segment is about four times as long as broad. The penultimate

segment is broadest at the base and narrows towards the top; it is slightly more than twice as long as its greatest breadth. The antepenultimate segment is 1.5 times as long as the two last segments combined, and is about twice as long as broad. The exopod is strong and reaches the middle of the penultimate segment.

The first pereiopod is slender and reaches with the entire chela and the larger part of the carpus beyond the scaphocerite. The fingers are about as long as the palm, they are slender, unarmed and provided with long hairs. The carpus is about 1.5 times as long as the chela, it is broadest anteriorly and narrows posteriorly. The merus is as long as the carpus and twice as long as the ischium. The second pereiopods are strong and equal, they reach with the chela beyond the scaphocerite. The fingers are short, measuring about $^1/_3$ of the length of the palm; they are stout and have the tips curved. The dactylus bears one strong ventral tooth, which fits between two dorsal teeth of the

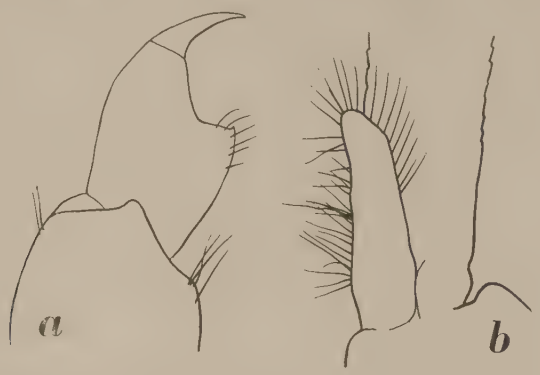


Fig. 98. *Conchodytes monodactylus* nov. spec. a, dactylus of third pereiopod; b, endopod of first pleopod of male. a, × 50; b, × 25.

fixed finger; the teeth are broad and often finely serrate. The palm is swollen and cylindrical. The carpus is short and triangular, it is slightly less than half as long as the palm. The merus, the carpus and the ischium are subequal in length, all of them are unarmed. The last three pereiopods are rather slender. The third reaches beyond the scaphocerite. The dactylus (fig. 98a) ends in a curved claw and is provided with a large basal tubercle at the posterior margin. No accessory spine is present before the apex of the dactylus. The basal tubercle is rounded, but is provided at the top with a minute, rather acute point, like in *C. biunguiculatus*. The propodus is more than four times as long as the dactylus, it is slightly curved and about four times as long as broad. The carpus measures $^3/_4$ of the length of the propodus. The merus is distinctly longer than the propodus. The ischium is half as long as the propodus.

The endopod of the first pleopod of the male (fig. 98b) is more slender than that of *C. tridacnae*.

The uropods are rather broad, ovate in shape and shorter than the telson. The outer margin of the exopod is convex and ends in a minute spine.

Ovigerous females are much broader than males and have the carapace and abdomen much more swollen. The second pereiopods in the females are relatively smaller than in the males.

The present species differs from all other *Conchodytes* species by having the dactylus of the last three pereiopods provided with one claw only. It shows most resemblance to *C. biunguiculatus*, which species also inhabits bivalves of the genus *Pinna*, and among material of which species from

Formosa the new species was found in the collection of the Leiden Museum. With both *C. biunguiculatus* and *C. nipponensis* it has the presence of a small tooth on the basal process of the dactylus in common, this tooth, however, is not so distinct as in P a u l s o n's species. The shape of the dactylus of the last three legs much resembles that of *Dasella herdmaniae* (Lebour); from that species *Conchodytes monodactylus* differs by the absence of the antennal spine and by the broad inner lacinia of the maxillula, which two characters show that the species is a true *Conchodytes*.

Cavicheles nov. gen.

Definition: Pontoniid prawns of unknown association. Body slender, slightly depressed. Carapace smooth, provided with a small antennal spine only, hepatic spine absent. Rostrum compressed, provided with teeth.

Abdomen smooth. Pleurae of first five segments broadly rounded. Sixth abdominal segment elongate. Telson elongate, dorsally with two pairs of small spinules, posterior margin with three pairs of spinules.

Eyes well developed; cornea very small, much narrower than the stalk, hemispherical.

Basal segment of antennular peduncle broad, with the stylocerite slender, pointed; anterolateral spine of basal segment well developed. Upper antennular flagellum consisting of two rami, which for the larger part are fused.

Scaphocerite well developed, not very broad, final tooth distinct. Antennal peduncle not reaching the middle of the scaphocerite. A small spine is placed at the external margin of the basal part of the peduncle.

Mandible without palp, both incisor and molar processes slender, molar process with spines in the distal part. Maxillula with inner lacinia slender, palp absent (?). Maxilla with the scaphognathite broad, endite well developed, bilobed. All maxillipeds with distinct exopods. Second maxilliped without podobranch, third maxilliped without arthrobranch.

First pereiopods unknown. Second pereiopods equal in shape and size. Fingers without teeth, hollowed at the inner surface, tips curved inward. Last three pereiopods short and stout, dactylus with a distinct basal protuberance which is pointed and bears at the lower margin some very small squamae; tip of dactylus articulated.

Uropods elongate. Outer margin of exopod ending in two spines.

Type species: *Cavicheles kempi* nov. spec.

The present genus seems to be most closely related to *Dasella* and *Coralliocaris*. From the first of these genera it differs by having the rostrum provided with teeth, by the shape of the last three pereiopods, by the absence of an arthrobranch at the third maxilliped and by the uropodal exopod, which has the outer margin ending into two spines. From *Coralliocaris* it differs by having the protuberance of the dactylus of the last three pereiopods not hoofshaped but flat, by having the body not strongly depressed and by the absence of an arthrobranch on the third maxilliped.

Cavicheles kempi nov. spec. (figs. 99-101)

Snellius Expedition

Ternate; pier; divinghood; depth about 4 m; August 1, 1930 [1]). — 1 specimen 7 mm.

The body is slightly depressed. The rostrum is distinctly compressed, it is straight and reaches about to the end of the antennular peduncle; the upper margin is slightly convex and bears five

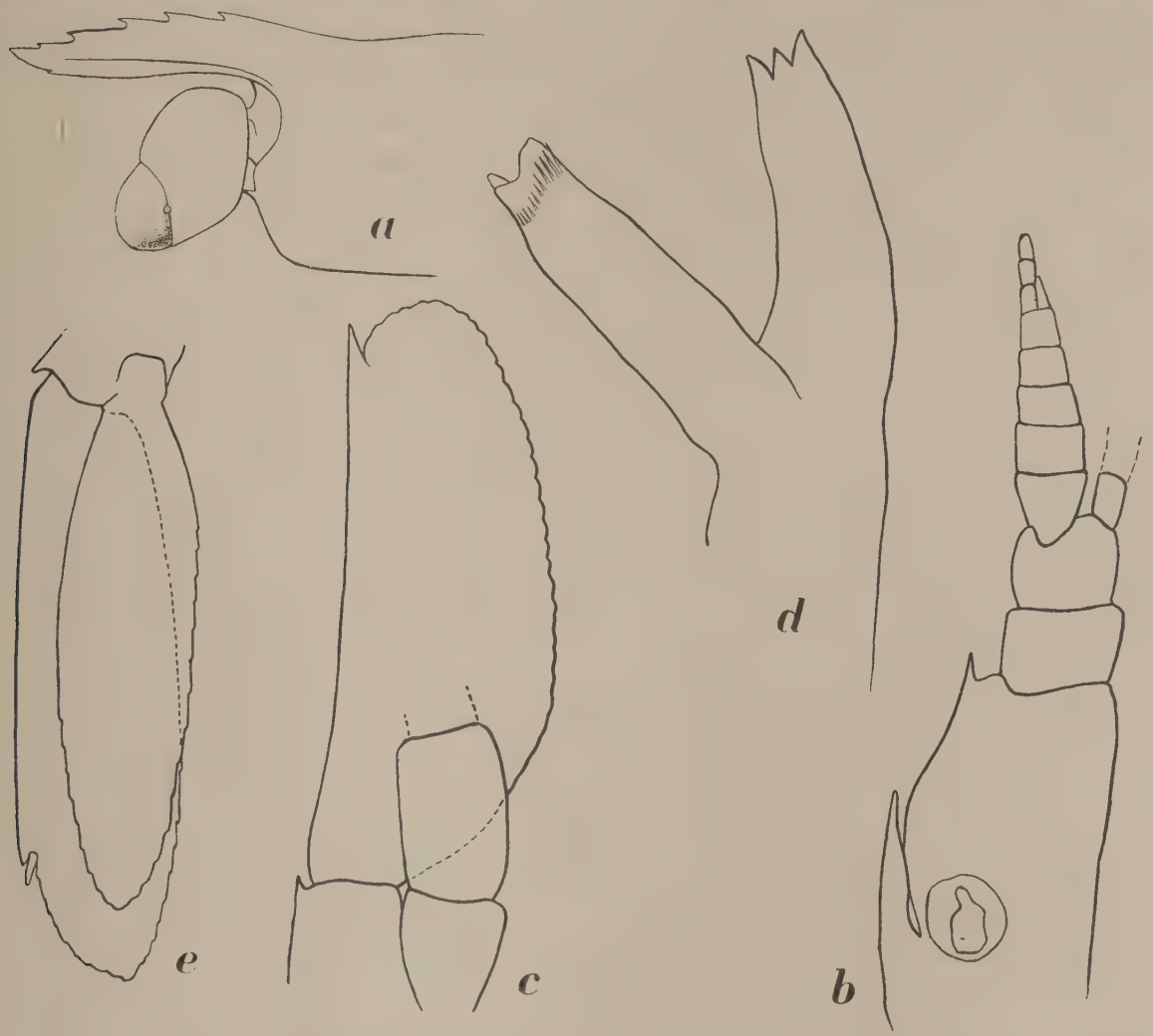


Fig. 99. *Cavicheles kempi* nov. gen. nov. spec. a, anterior part of carapace and eye, lateral view; b, antennula; c, antenna; d, mandible; e, uropod. a, × 38; b, c, e, × 75; d, × 300.

distinct teeth, which all are placed on the rostrum proper. The lower margin bears one small tooth near the apex. The midrib of the rostrum continues posteriorly in an indistinct postorbital ridge. The carapace is smooth and slightly depressed, it is provided with a small antennal spine, which is

1) The date August 1, 1930 in all probability is incorrect, as at that date the Snellius was not at Ternate but at Surabaya.

situated some distance below the rounded lower orbital angle. No hepatic or supraorbital spines are present. The anterolateral angle of the carapace is broadly rounded.

The abdomen is smooth. The pleurae of the first five segments are broadly rounded, that of the sixth segment is bluntly pointed; the posterolateral angle of the sixth segment is pointed too. The posterior margin of the third segment is slightly elevated above the upper surface of the fourth segment. The sixth segment is elongate, it is about twice as long as the fifth.

The telson is slightly shorter than the sixth abdominal segment, it is about thrice as long as its basal breadth. The dorsal surface of the telson bears two pairs of small spinules, which both are placed in the posterior half of the telson; the posterior pair is placed more closely to the anterior pair than to the posterior margin of the telson. This posterior margin bears three pairs of spinules, the outer of which are very short, the intermediate are longest, the submedian are sligtly more than half as long as the intermediate.

The eyes are short, they fail to reach to the end of the antennular peduncle. The cornea is much shorter and narrower than the eyestalk. A distinct ocellus is present.

The basal segment of the antennular peduncle (fig. 99b) is broad, the stylocerite is rather slender and pointed, it is directed anteriorly and reaches beyond the middle of the basal segment. The outer anterolateral angle of the basal segment bears a distinct spine, which reaches about to the middle of the second segment of the peduncle. The second segment is about as broad as, but shorter than the third; together these segments are half as long as the basal segment. The inner flagellum is lacking in one of the antennulae, in the other only the basal segment is present. The outer flagellum is broadened, the fused portion consists of about 5 joints, the free part of the shorter ramus is extremely short and consists of 1 joint, the longer ramus has the free part composed of 3 joints.

The scaphocerite (fig. 99c) is well developed and reaches beyond the antennular peduncle. The outer margin is slightly concave and naked, it ends in a strong tooth, which reaches about as far forward as the lamella. The lamella is somewhat broadened in the basal part, the anterior margin is rounded. The end of the antennal peduncle fails to reach the middle of the scaphocerite. A small blunt spine is present at the basal part of the outer margin of the antennal peduncle.

The mandible (fig. 99d) bears no palp, the incisor process is slender and ends in three distinct teeth, the molar process too is slender, it ends in some blunt knobs and is provided in the distal part with a row of spines. The maxillula (fig. 100a) has the inner lacinia slender and ending in some hairs, the upper lacinia bears some short spines, no palp is observed, but it may be lost during the dissection of the maxillula. The maxilla (fig. 100b) has the scaphognathite broad, the palp is distinct, the endite is distinctly cleft. The first maxilliped (fig. 100c) has the basis and coxa separated by a distinct notch, the palp is well developed, the exopod is large and has the caridean lobe rather short and broad, the epipod is distinctly bilobed. The second maxilliped (fig. 100d) is normal in shape, it has the exopod well developed, an epipod is present, the podobranch is absent. The third maxilliped (fig. 100e) is slender, the ultimate segment is slightly longer than the penultimate; the antepenultimate segment is somewhat shorter than the last two segments combined, it is about thrice as long as broad. The exopod is well developed, no arthrobranch is present.

The first pereiopods are lacking in my specimen. The second pereiopods (figs. 101a-c) are equal in shape, the fingers are somewhat shorter than the palm, the tips are curved inward, the inner side of the fingers is strongly hollowed. The cutting edges are entire, they bear no teeth at all; the

fingers are slightly gaping. The carpus is short, it is less than half as long as the palm and narrows posteriorly. The merus is slender, it is as long as the palm and is slightly more than four times as long as broad. The ischium measures $^2/_3$ of the length of the merus. The last three legs (fig. 100f) are rather short and broad. The dactylus (fig. 100g) is strongly curved, it bears a large broad and pointed

Fig. 100. *Cavicheles kempi* nov. gen. nov. spec. a, upper and inner lacinia of maxillula; b, maxilla; c, first maxilliped; d, second maxilliped; e, third maxilliped; f, third pereiopod; g, dactylus third pereiopod. a-c, × 75; f, × 38; g, × 300.

protuberance in the basal part of the posterior margin. This protuberance is almost as long as the dactylus itself and is triangular in shape, it is flat and not hoofshaped as in *Coralliocaris* and *Jocaste*. The posterior margin of the protuberance bears some small squamiform elevations, which are visible only under a strong magnification. The tip of the dactylus is separated from the rest by an articulation. The propodus is $2^1/_2$ times as long as the dactylus and is about $3^1/_2$ times as long as broad, at the posterior margin it bears some stiff hairs, in the anterior part of the propodus some longer hairs are present. The carpus is about half as long as the propodus, it bears a large tooth-like process in the upper anterior part, which reaches over the articulation with the propodus. The merus is somewhat longer and about as broad as the propodus. The ischium is short.

The pleopods are normal in shape. As the only specimen is a female, nothing is known of the structure of the first pleopods of the male.

The uropods (fig. 99e) reach distinctly beyond the telson. The endopod is oval in shape. The exopod is longer than the endopod, the outer margin is straight and naked, it ends in two distinct spines, the inner of which is movable.

The present species is most closely related to *Dasella herdmaniae* (Lebour), but differs from that species in a good many points, the most important of which have already been pointed out in the key to the genera.

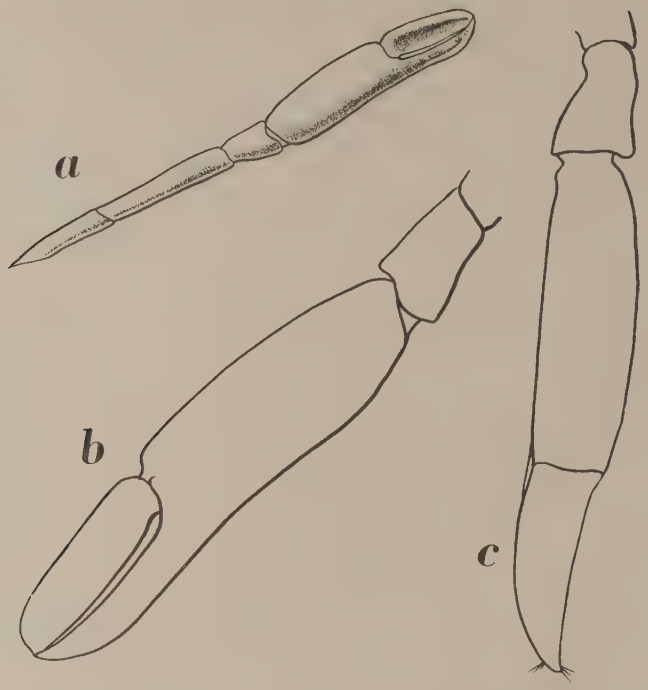


Fig. 101. *Cavicheles kempi* nov. gen. nov. spec. a, second pereiopod, internal view; b, chela of second pereiopod, external view; c, chela of second pereiopod, dorsal view. a, × 38; b, c, × 75.

Hamodactylus nov. gen.

Definition: Free living (?) Pontoniid prawns. Body slender, compressed. Carapace smooth, provided with antennal and hepatic spines, supraorbital spines sometimes present. Rostrum compressed, dorsally provided with teeth.

Abdomen smooth. Pleurae of first four segments broadly rounded, that of the fifth segment bluntly pointed. Sixth abdominal segment long. Telson rather short and narrow, dorsally with two pairs of spinules, posterior margin with three pairs of spinules.

Eyes well developed, cornea slightly elongate, rounded.

Antennular peduncle with the stylocerite slender and pointed. Two flagella, the upper of which ends in two rami.

Scaphocerite well developed, rather slender, ending in a distinct final tooth.

Mandible without palp, incisor process broad, ending in several large teeth, molar process narrow, with many spines at the apex, without blunt knobs. Maxillula with the inner lacinia slender, upper lacinia not very broad, palp distinctly bilobed. Maxilla with the scaphognathite large, not very

broad, palp distinct, endite in the only species well developed, ending in two lobes. First maxilliped with the epipod distinct, bilobed; flagellum of exopod much reduced, caridean lobe well developed and longer than broad; palp short, no notch between basis and coxa. Second maxilliped without exopod, dactylus very small, placed at the end of propodus, other joints typical, epipod well developed, no podobranch present. Third maxilliped slender, without exopod, without arthrobranch.

First pereiopods of normal shape, slender. Second pereiopods about as slender as first, almost subchelate, dactylus being much longer than fixed finger and strongly curved. Fingers without teeth. Carpus short. Last three pereiopods rather strong. Dactylus simple, without basal protuberance.

Uropods normal in shape.

By the absence of the exopods of the maxillipeds, the present genus shows to be most closely related to *Pontonides*, and *Anchistioides*. From the first genus it differs in the more compressed shape of the body, in the dentate rostrum and in the presence of a hepatic spine on the carapace. From *Anchistioides* the present genus differs by the shape of the rostrum, by having the stylocerite well developed and by the rounded anterior angle of the antennal scale. From both genera *Hamodactylus* may be distinguished at once by the peculiar shape of the second pereiopods.

The type of the genus is

Hamodactylus boschmai nov. spec. (figs. 102-104)

Siboga Expedition

Station 273, Djedan Island, eastcoast of the Aru Islands; pearlbank; trawl, dredge and divers; depth 13 m; bottom sand and shells; December 23-26, 1899. — 1 ovigerous female 11 mm.

Snellius Expedition

Ternate; divinghood; 2-4 m; June 6, 1930. — 1 ovigerous female 13 mm and 2 juvenile specimens each 6 mm.

The rostrum is high and compressed, it almost reaches the end of the antennular peduncle. The upper margin is strongly convex and bears five teeth, the lower margin is straight and bears no teeth. The apex is sharply pointed. The dorsal teeth all are placed on the rostrum proper. The rostrum bears a lateral carina close to the lower margin. The carapace is smooth or slightly rugose. The supra-orbital spines are present. The lower angle of the orbit is produced into a rather narrow lobe. A small antennal spine is situated just below the lower orbital angle. The hepatic spine is placed on a lower level than the antennal spine and is much stronger than it; it is distinctly remote from the anterior margin of the carapace. The anterolateral angle of the carapace is rounded.

The abdomen is smooth. The pleurae of the first four segments are broadly rounded. The pleura of the fifth segment is narrow, but rounded also. The sixth segment is very long, being about twice as long as the fifth, it is compressed. The pleura of the sixth segment is small and pointed.

The telson (fig. 103c) is distinctly shorter than the sixth abdominal segment, it is strongly narrowed posteriorly. The dorsal surface is provided with two pairs of spinules, which are situated in the posterior (narrow) half of the telson close to the lateral margins; the distal pair is placed closer to the posterior margin of the telson than to the proximal pair. The posterior margin is provided

with three pairs of spinules; the outer pair is shortest, the two inner pairs are subequal in length and much longer than the outer pair.

The eyes are well developed; the cornea is about as broad as the stalk, and is placed obliquely on it. A small ocellus is present.

The first segment of the antennular peduncle has the stylocerite slender and narrow, it reaches slightly beyond the middle of the segment. The anterolateral angle of the basal segment is provided with a distinct spine, which fails to reach the middle of the second segment of the peduncle. This second segment is slightly broader and longer than the third; together the two segments are about half as long as the first. The inner flagellum of the antennula has the fused part of the two rami

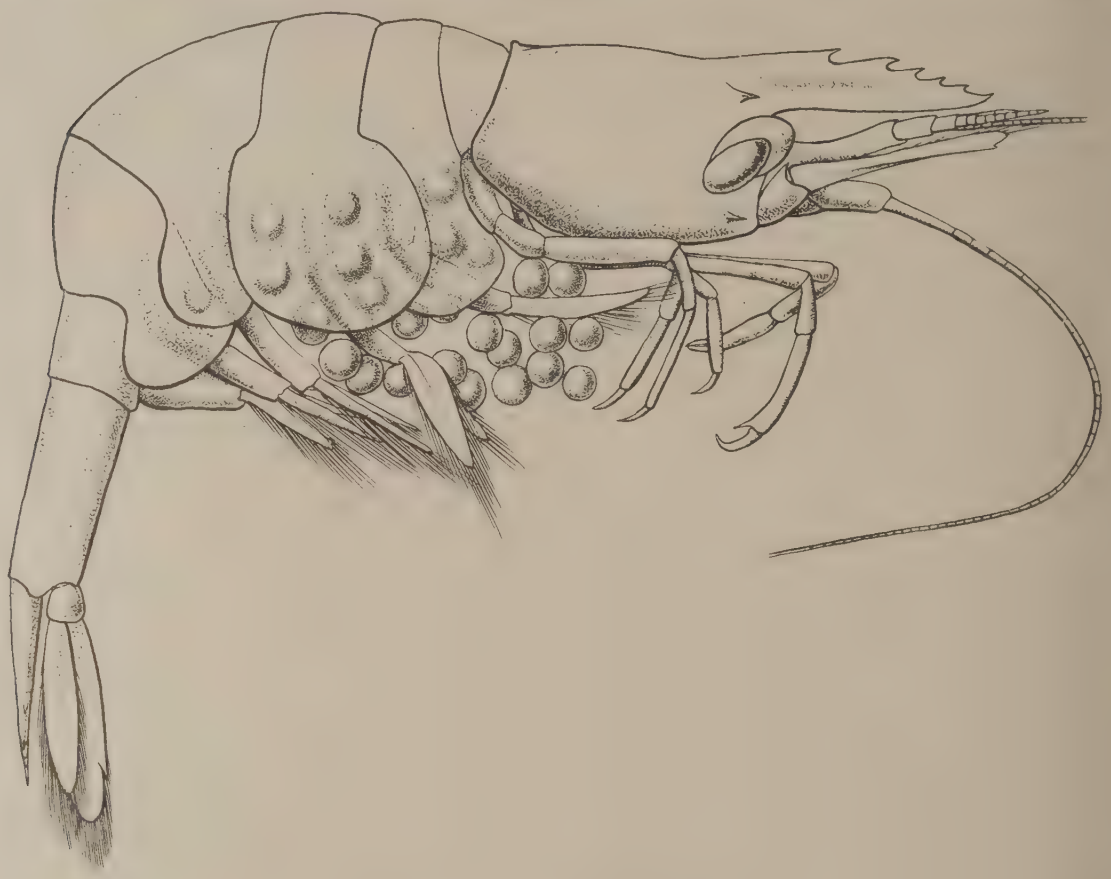


Fig. 102. *Hamodactylus boschmai* nov. gen. nov. spec. × 18.

consisting of three joints; the free part of the shorter ramus is formed by two joints.

The scaphocerite reaches far beyond the end of the antennular peduncle. The lamella is rather broad and reaches distinctly beyond the final tooth. The outer margin is convex in the lower part, concave distally, it ends in a strong final tooth. The antennal peduncle bears no spine, the last segment of the peduncle fails to reach the middle of the scaphocerite.

The oral parts are figured here (figs. 104a-f). The main characters are given in the generic diagnosis. The third maxilliped (fig. 104f) reaches almost to the base of the scaphocerite. The last segment is about $^1/_2$ to $^3/_4$ of the length of the penultimate. The antepenultimate segment is distinctly

broader than the two last segments and is almost twice the length of the ultimate and penultimate segments combined. No arthrobranch is present. No exopod is present, just like in the first and second maxillipeds.

The first pereiopod (fig. 104g, h) fails to reach the end of the scaphocerite. The chela has the fingers flat, depressed and unarmed. The palm is slightly longer than the fingers. The carpus is slightly longer than the palm and distinctly shorter than the chela. The merus is as long as the chela. The ischium is short. The whole leg is rather stout and none of the joints is provided with spines. The second pereiopods (fig. 104i) are equal, they are slightly longer and distinctly slenderer

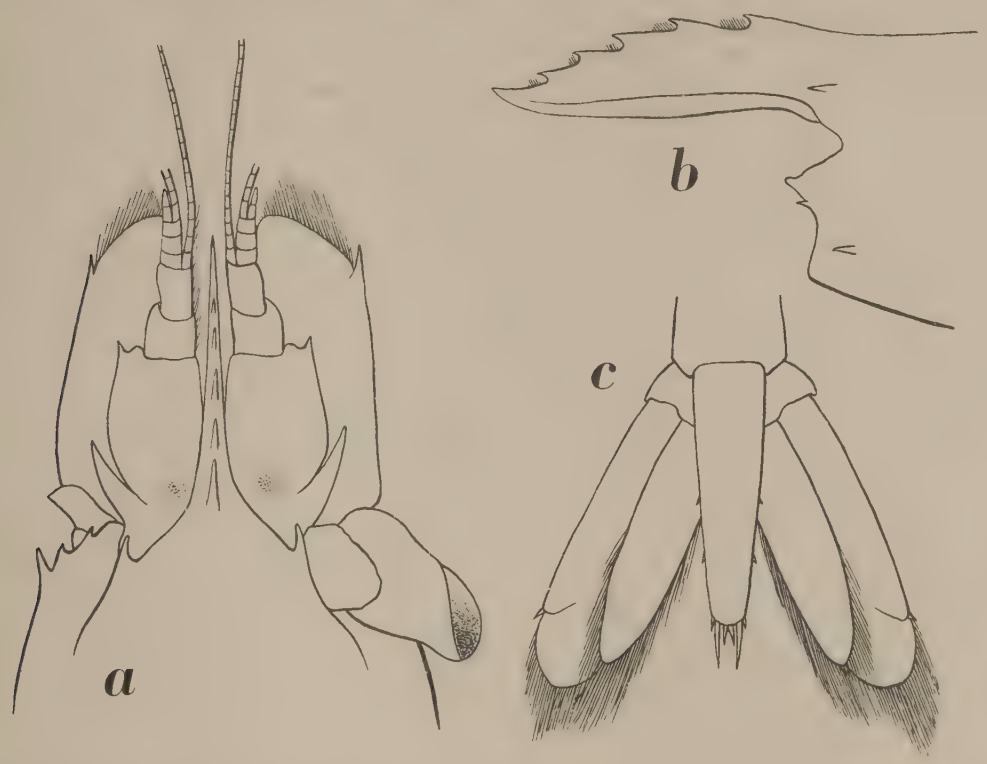


Fig. 103. *Hamodactylus boschmai* nov. gen. nov. spec. a, anterior part of body, dorsal view; b, anterior part of carapace, lateral view; c, telson and uropods, dorsal view. a-c, × 27.

than the first pereiopods. The chela is almost subchelate. The dactylus is strong and almost rectangularly curved near the apex, it is much longer than the fixed finger and about half as long as the palm. The fixed finger is slightly more than half as long as the dactylus and is much narrower than it. Neither of the two fingers is provided with teeth; the fixed finger bears some hairs near the tip. The palm is cylindrical and slender, it is slightly curved. The carpus is slightly less than half as long as the chela and measures about $^3/_4$ of the length of the merus, it is unarmed and about as broad anteriorly as posteriorly. The merus too is unarmed. The ischium is slightly shorter than the merus and bears no spines. The last three pereiopods (fig. 104k) are about as long as the first two legs. The dactylus of the third pereiopod is strong, simple and slightly swollen at the base, it ends in a sharp point. The propodus is almost 1.5 times as long as the dactylus, it bears no spinules. The carpus is about as long as the dactylus. The merus is about as long as, but slightly stronger than the

propodus. The ischium is somewhat more than half as long as the merus. The fourth and fifth pereiopods are similarly built as the third.

The uropods are distinctly longer than the telson. The endopod is shorter than the exopod. The outer margin of the exopod is straight, naked and ends in one tooth.

The juvenile specimens have the rostrum shorter and provided with less teeth.

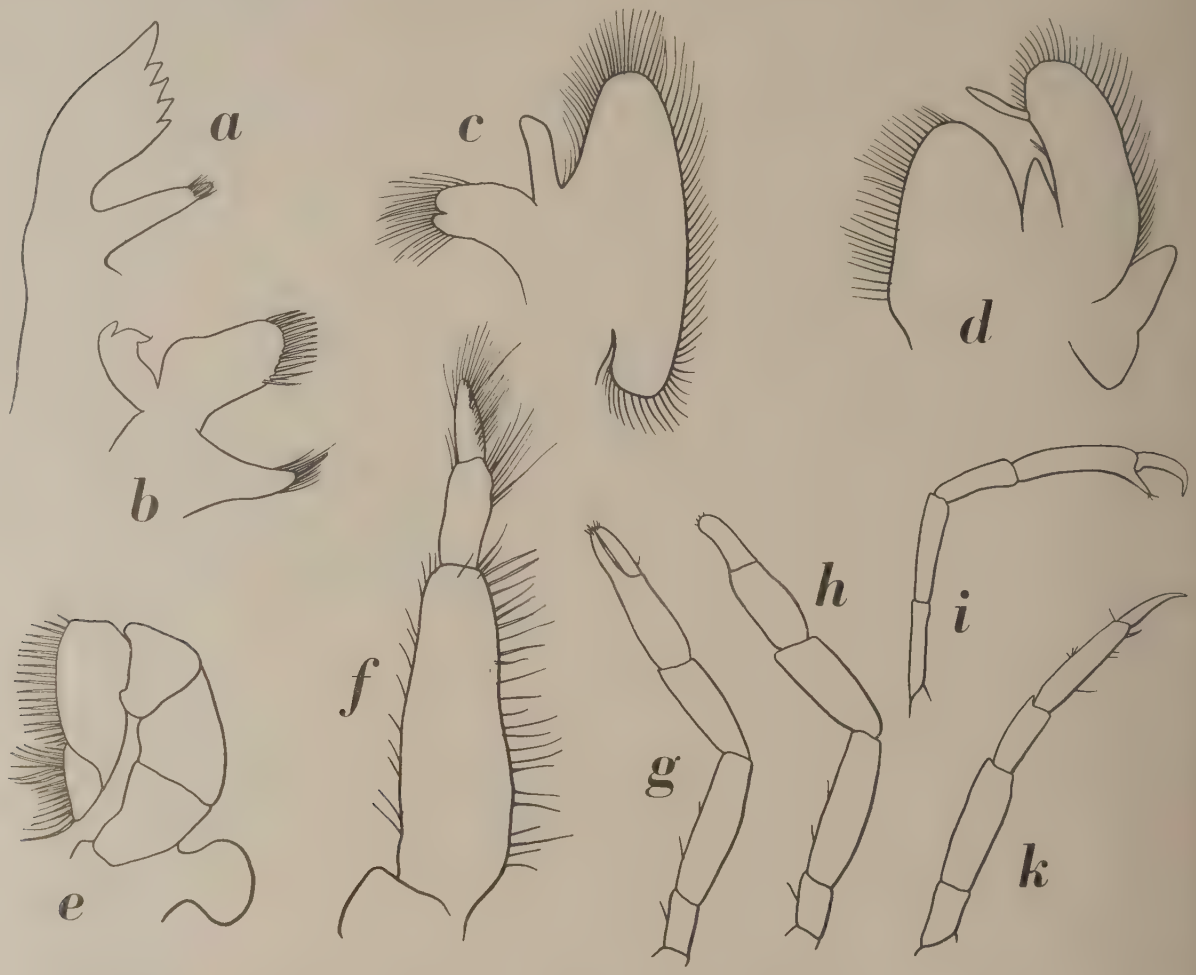


Fig. 104. *Hamodactylus boschmai* nov. gen. nov. spec. a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, third maxilliped; g, first pereiopod, lateral view; h, first pereiopod, dorsal view; i, second pereiopod; k, third pereiopod. a-f, × 67; g-k, × 27.

Hamodactylus boschmai nov. var.? (fig. 105)

Snellius Expedition

Ternate; divinghood; depth 2-4 m; June 6, 1930. — 2 ovigerous females 9 and 10 mm.

Among the material of *Hamodactylus boschmai* from Ternate two adult female specimens are found, which closely resemble the above species, but in some important points show distinct differences. As the specimens are damaged (they lack the last four pairs of pereiopods), I think it

better not to make them the types of a new species or variety and only give here their most important characters.

The differences from *Hamodactylus boschmai* are:

1. The rostrum is much shorter, reaching only slightly beyond the end of the first segment of the antennular peduncle; it is provided with 3 or 4 dorsal teeth only.
2. No trace of a supraorbital spine is visible on the carapace.
3. The anterolateral angle of the first segment of the antennular peduncle bears two or three anteriorly directed spines, while only one spine is present in *H. boschmai.*

In all other characters there is the closest resemblance between the two forms, but perhaps more differences may be provided by the shape of the second legs and by the last three pereiopods, which are lacking in my material.

Fig. 105. *Hamodactylus boschmai* var. anterior part of body, dorsal view. × 35.

Anchistioides Paulson, 1875

This genus during a long period has been considered to form a separate family Anchistioididae belonging to the tribe Crangonoida. It therefore is not inserted in Kemp's (1922) paper on the Pontoniinae. Quite recently, however, Gordon (1935) gave some important remarks on the genus and pointed out that its correct place in the system is in the subfamily Pontoniinae of the family Palaemonidae, and that by the absence of an exopod of some of the maxillipeds is most closely related to the genera *Pontonides* and *Balssia.* The genus differs from most other genera of Pontoniinae by the small number of spines at the posterior margin of the telson, by the total absence of the endites of the maxilla, by having the exopods of the first and the third maxillipeds strongly reduced, while that of the second maxilliped is well developed, by the presence of an appendix interna at the endopod of the first pleopod in both the male and the female. Gurney (1938) found important

differences between the larvae of the present genus and those of *Periclimenes*. Therefore he suggested to place *Anchistioides* in a separate subfamily Anchistioidinae of the family Palaemonidae. The features of the adult specimens, in my opinion, do not justify such a separation, the more as we know at present so little of the larval and even of some adult characters of related genera. I therefore retain, provisionally at least, the genus in the subfamily Pontoniinae.

At present four species of this genus are known, only one is represented in the collections at hand.

Anchistioides willeyi (Borradaile) (figs. 106, 107)

Palaemonopsis willeyi Borradaile, 1899, Willey's Zool. Res., vol. 4, p. 410, pls. 36, 37 fig. 7.
Amphipalaemon willeyi Nobili, 1901, Boll. Mus. Zool. Anat. comp. Torino, vol. 16 n. 402, p. 5.
Amphipalaemon gardineri Borradaile, 1915, Ann. Mag. nat. Hist., ser. 8 vol. 15, p. 209.
Amphipalaemon cooperi Borradaile, 1915, Ann. Mag. nat. Hist., ser. 8 vol. 15, p. 209.
Amphipalaemon willeyi Borradaile, 1917, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 407, pl. 59 fig. 13.
Amphipalaemon gardineri Borradaile, 1917, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 407, pl. 59 fig. 14.
Amphipalaemon cooperi Borradaile, 1917, Trans. Linn. Soc. Lond. Zool., ser. 2 vol. 17, p. 407.
Amphipalaemon australiensis Balss, 1921, K. Svenska Vetensk. Akad. Handl., vol. 61 pt. 10, p. 11, figs. 3-6.
Anchistioides willeyi Gordon, 1935, Journ. Linn. Soc. Lond. Zool., vol. 39, p. 345, figs. 23a, 24a.
Anchistioides gardineri Gordon, 1935, Journ. Linn. Soc. Lond. Zool., vol. 39, p. 345, figs. 23b, 24b.
Anchistioides cooperi Gordon, 1935, Journ. Linn. Soc. Lond. Zool., vol. 39, p. 345, figs. 23c, 24c.
Anchistioides australiensis Gordon, 1935, Journ. Linn. Soc. Lond. Zool., vol. 39, p. 345, figs. 23d, 24d.

Siboga Expedition

Station 80, Borneo Bank, 2° 25′ S, 117° 43′ E; trawl, Hensen quantitative net from 34 m to surface, Hensen vertical net (with electric light in it); depth from 50 till 40 m; bottom fine coral sand; June 13, 1899. — 1 specimen 35 mm.
Station 106; anchorage off Kapul Island, Sulu Archipelago; among plankton; dredge and townet; depth 13 m; coral bottom; July 4, 1899. — 1 specimen 17 mm.
Station 273, anchorage off Djedan Island, eastcoast of Aru Islands; in sponge; pearl banks; trawl, dredge and divers; depth 13 m; bottom sand and shells; December 23-26, 1899. — 2 specimens 18 and 24 mm.

Museum Leiden

Java Sea, 4° 25′ S, 114° 31′ E; Gier Expedition G. 12 E. 3; in sponge; depth 20-23 m; October 4, 1908. — 1 ovigerous female 41.5 mm.

The rostrum is large and reaches beyond the scaphocerite, it is straight. The upper margin is provided with 6 to 9 teeth, which all are placed on the rostrum proper, generally the last tooth is separated from the tip by an interval, which is distinctly larger than the distances between the other teeth. The lower margin of the rostrum is provided with 2 to 4 teeth, which are much broader than the dorsal teeth and are set much wider apart. The carapace is smooth and is provided with a supra-orbital spine, which may be reduced to a mere blunt tubercle. The lower orbital angle is narrowly rounded. The antennal spine is strong and placed a large distance below the lower orbital angle on the anterior margin. The anterolateral angle of the carapace is rounded.

The abdomen is smooth. The pleurae of the first five segments are broadly rounded. The sixth segment has the pleura ending in a posteriorly directed spine. The posterolateral angle of this segment is rounded. The posterior margin is provided with a spine at each half. The sixth segment is about as long as the fifth.

Fig. 106. *Anchistioides willeyi* (Borr.) in sponge (specimen from Java Sea). natural size.

The telson is more than twice as long as the sixth abdominal segment; it is provided with two dorsal longitudinal carinae, between which the surface of the telson is concave. The dorsal surface is provided with two pairs of spinules, which both are placed on the carinae, the proximal pair is situated close to the anterior margin of the telson, while the posterior pair lies in about the middle of the telson. The posterior margin of the telson bears two distinct spines and some setae. The spines vary slightly in length.

The eyes are rather small. The cornea is hemispherical, slightly broader than and about as long as the stalk.

The basal segment of the antennular peduncle has the stylocerite reduced to a mere tubercle.

The anterolateral spine of that segment is strong, but fails to reach the middle of the second segment. The third segment of the antennular peduncle is slightly narrower and distinctly longer than the second. The second and third segments together are shorter than the first. The upper antennular flagellum is strong and consists of two rami, of which the shorter is fused with the longer for the greater part of its length.

The scaphocerite reaches far beyond the antennular stalk, it is broadest at base and narrows towards the top. The inner anterior angle is sharply rectangular. The outer margin is convex in its proximal part, concave in the distal part. The final tooth is strong and reaches distinctly beyond the lamella. The antennal peduncle bears no spine, its last segment fails to reach the middle of the scaphocerite.

The mandible (fig. 107a) bears no palp, the incisor process is rather broad and ends in three teeth, the molar process is slender at base and considerably widens towards the top, there it bears some rather sharp knobs, no spines could be observed on the molar process. The maxillula (fig. 107b) has the inner lacinia short and not very broad, the upper lacinia ends in some strong spines, the palp is well developed and bilobed. The maxilla (fig. 107c) differs from that of all other Pontoniid genera by lacking the endite, the scaphognathite is large and rather narrow, the palp is well developed. The first maxilliped (fig. 107d) possesses a large epipod, which is indistinctly bilobed, the exopod has the flagellum strongly reduced, the caridean lobe is large and much longer than broad, the palp is well developed and pointed, the basis and coxa are indistinctly separated. The second maxilliped (fig. 107e) is normal in shape, the exopod is well developed, the epipod is large, no podobranch is present. The third maxilliped (fig. 107f) is very slender, it reaches about to the middle of the basal segment of the antennular peduncle. The ultimate segment is slightly shorter than the penultimate, together they are about $^2/_3$ of the length of the antepenultimate segment, which is slightly curved. No exopod is present.

The first pereiopod just reaches the end of the scaphocerite. The fingers are slightly shorter than the palm, they are unarmed and provided with tufts of setae on the tips. The carpus is about 1.5 times as long as the chela. The merus is slightly shorter than the carpus. The ischium is a little longer than half the merus. The second pereiopods are equal and reach with a part of the palm beyond the scaphocerite. The fingers are very long and slender, they are from 1.1 to 1.6 times as long as the palm, the tips are curved and crossing. The outer margin of the cutting edge of each finger is elevated to a ridge, which at its inner side is provided with small denticles, but which is entire dorsally. The palm is cylindrical. The carpus is short and less than half as long as the palm, it is unarmed and slightly narrowed behind. The merus is long, narrowing posteriorly and is about 4 times as long as the carpus. The third pereiopod is slender and reaches slightly beyond the base of the scaphocerite. The dactylus is narrow and ends in a sharp point, the lower margin is provided with a small accessory spine behind the apex. The propodus is 3 to 5.6 times as long as the dactylus and is provided with some spinules in the distal part of the posterior margin. The carpus is about half as long as the propodus. The ischium is more than half as long as the merus. The fourth and fifth pereiopods are similarly built as the third.

The endopod of the first pleopod in the male (fig. 107g) as well as in the female bears an appendix interna. The uropods are about as long as the telson. The exopod has the outer margin almost straight, naked and ending into two spines.

Gordon (1935), who examined the type specimens of *A. willeyi* as well as those of *A. gardineri*, *A. cooperi* and *A. australiensis*, already pointed out that *A. willeyi* and *A. gardineri* are the

Fig. 107. *Anchistioides willeyi* (Borr.). a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, third maxilliped; g, endopod of first pleopod of male. a-f, × 33; g, × 67.

same species, that *A. cooperi* may be a juvenile specimen of that species and that *A. australiensis* only shows some minor differences with *A. willeyi,* namely:

1. the rostrum in *A. australiensis* is somewhat longer than in *A. willeyi,*
2. the fingers of the second pereiopod in *A. willeyi* are relatively shorter than in *A. australiensis,* in *A. willeyi* namely the relation between the length of the fingers and that of the palm is 1.12, in *A. australiensis* this relation is 1.3 and 1.59,
3. the spines at the posterior margin of the telson are slightly longer in *A. australiensis* than in *A. willeyi.*

The following table gives some data of my specimens:

material	total length mm	rostral formula	length rostrum mm	relation finger/palm 2nd pereiopod	relation total length/ length rostrum
Siboga Sta. 80	35	9 : 4	6	1.08	5.8
Siboga Sta. 106	17	9 : 4	4	—	4.2
Siboga Sta. 273	24	6 : 2 ?	apex broken	1.33	—
Siboga Sta. 273	18	7 : 3	4.2	1.44	4.3
Java Sea	41.5	7 : 2	6.5	1.08	6.4

As shown in the table the rostrum is rather variable in length, being from 4.2 to 6.4 times shorter than the carapace. Also the relation between the length of the finger and that of the palm of the second pereiopod varies over a large distance in my material (1.08-1.44). As may be observed the larger specimens have the fingers of the second leg as well as the rostrum shorter than in the smaller specimens, it is therefore very probable that the fingers and the rostrum become relatively shorter with age. This supposition also is in agreement with the facts given in literature, the specimens of *A. australiensis* namely are smaller than that of *A. willeyi* and have, as is shown by G o r d o n, the fingers and the rostrum longer than in the latter species. In the following table the relative lengths of the rostrum and that of the fingers of the second pereiopods in the type specimens of *A. willeyi* and *A. australiensis* as well as in my material of the present species are given. The specimens are arranged according to their size:

material	total length mm	relation total length/ length rostrum	relation finger/palm 2nd leg.
Java Sea	41.5	6.4	1.08
Siboga Sta. 80	35	5.8	1.08
A. willeyi type	30	> 4.3	1.12
A. austral. type	24	4.3	1.30
Siboga Sta. 273	24	—	1.33
Siboga Sta. 273	18	4.3	1.44
Siboga Sta. 106	17	4.2	—
A. austral. type	16	4.0	1.59

The spines at the posterior margin of the telson are variable in shape in my material.

From the above it becomes clear that *A. australiensis* and *A. willeyi* can not be kept separate, as *A. australiensis* is based on not yet fullgrown specimens of *A. willeyi*. Therefore Gordon's supposition that *A. willeyi, A. gardineri, A. cooperi* and *A. australiensis* are co-specific proves to be correct.

Vertical distribution. The species is a litoral form and is associated with sponges. The latter fact up till now has not yet been recorded in literature, but is shown by the present material. The specimen from Station 273 was found in a narrow canal of a sponge and was closely surrounded by the sponge tissue. The specimen from the Java Sea (fig. 106) inhabited a rather large cavity of a large globular sponge; this cavity possesses a relatively small external aperture, but is so large itself that the shrimp had space enough to move rather freely in it.

Horizontal distribution. The species is recorded in literature from: N. Male Atoll, Maldive Archipelago (Borradaile, 1915, 1917; Gordon, 1935), S. Nilandu Atoll, Maldive Archipelago (Borradaile, 1915, 1917; Gordon, 1935), Cape Jaubert, N.W. Australia (Balss, 1921; Gordon, 1935), Ralun, New Britain (Borradaile, 1899; Gordon, 1935). The species now for the first time is recorded from the Malay Archipelago.

Pontonides Borradaile, 1917

According to Kemp (1922) the present genus consists of two species, namely the type species *P. maldivensis* (Borr.), and *Pontonides beaufortensis* (Borr.), the first species being reported from the Maldive Archipelago, the other from the eastcoast of America and the West Indies. In 1951 the latter species has been made by me the type of a new genus *Neopontonides*. In 1939 Calman described a new species of the present genus. This is the only species represented in the material at hand.

Pontonides unciger Calman (figs. 108-110)

Pontonides unciger Calman, 1939, Sci. Rep. John Murray Exped., vol. 6, p. 213, figs. 6, 7.

Siboga Expedition

Station 49a, Sape Strait, 8° 23'.5 S, 119° 4'.6 E; dredge; depth 70 m; bottom coral and shells; April 14, 1899. — 1 specimen 8 mm.

The rostrum is depressed, it is very broad at the base and ends in a sharp point. The tip of the rostrum fails to reach the end of the basal segment of the antennular peduncle. The lateral margins of the rostrum at each side are produced into a right angle, which overreaches the base of the eyes. The dorsal surface of the rostrum is provided with a median carina, which is highest posteriorly; the median carina of the lower surface of the rostrum is little pronounced. The carapace is areolated. Behind the orbit the carapace is deeply sunken. No supraorbital or hepatic spines are present, the lower orbital angle is broadly angular and blunt. The antennal spine is well developed and continues posteriorly in a carina. Below the antennal spine the anterior margin of the carapace is produced forward into a narrow lobe, which has the top rounded and which reaches about as far forward as the antennal spine. The anterolateral angle of the carapace is rounded.

The abdomen is areolated. The pleurae of the first four segments are rounded, the fifth ends in a rather narrow apex. The sixth segment is almost 1½ times as long as the fifth. The pleura of the sixth segment is triangular and pointed. The posterolateral angle of the sixth segment is broad and ends in a small sharp point.

Fig. 108. *Pontonides unciger* Calman. × 20.

The telson is longer than the sixth abdominal segment. The dorsal surface of the telson is provided with a shallow median groove and bears two pairs of spines. The first pair of these spines lies somewhat behind the middle of the telson, the second pair is placed closer to the posterior margin of the telson than to the anterior pair of spines. The posterior margin is provided with three pairs of spines, the outer of which is far the shortest.

The eyes are well developed. The cornea is hemispherical, about as broad as and a little shorter than the stalk. The stalk is provided with a tubercle in the anterior part, resembling thereby more or less *Periclimenes* (*Harpilius*) *seychellensis*.

The basal segment of the antennular peduncle is broad. The stylocerite is broad in the basal part and ends in a sharp point, which almost reaches the middle of the basal segment. The antero-lateral spine of the basal segment is strong, reaching almost beyond the end of the second segment of the antennular peduncle. This second segment is as broad as, but distinctly shorter than the third segment. These last two segments together are longer than half the basal segment of the peduncle. The upper antennular flagellum has the two rami fused for three joints, the free part of the shorter ramus consists of two joints.

The scaphocerite reaches about to the end of the antennular peduncle. The lamella is broad, has the anterior margin rounded and reaches beyond the final tooth. The outer margin of the scaphocerite is straight and ends in a stout final tooth. The antennal peduncle bears no spine; its last segment reaches beyond the middle of the scaphocerite.

The mandible (fig. 109a) bears no palp, the incisor process is slender and ends in three

teeth, the molar process too is slender, it bears some blunt knobs, but no spines are present. The maxillula (fig. 109b) has the inner lacinia slender, the upper lacinia is broader, the palp is well developed and is distinctly bilobed. The maxilla (fig. 109c) is peculiar by the very strong reduction

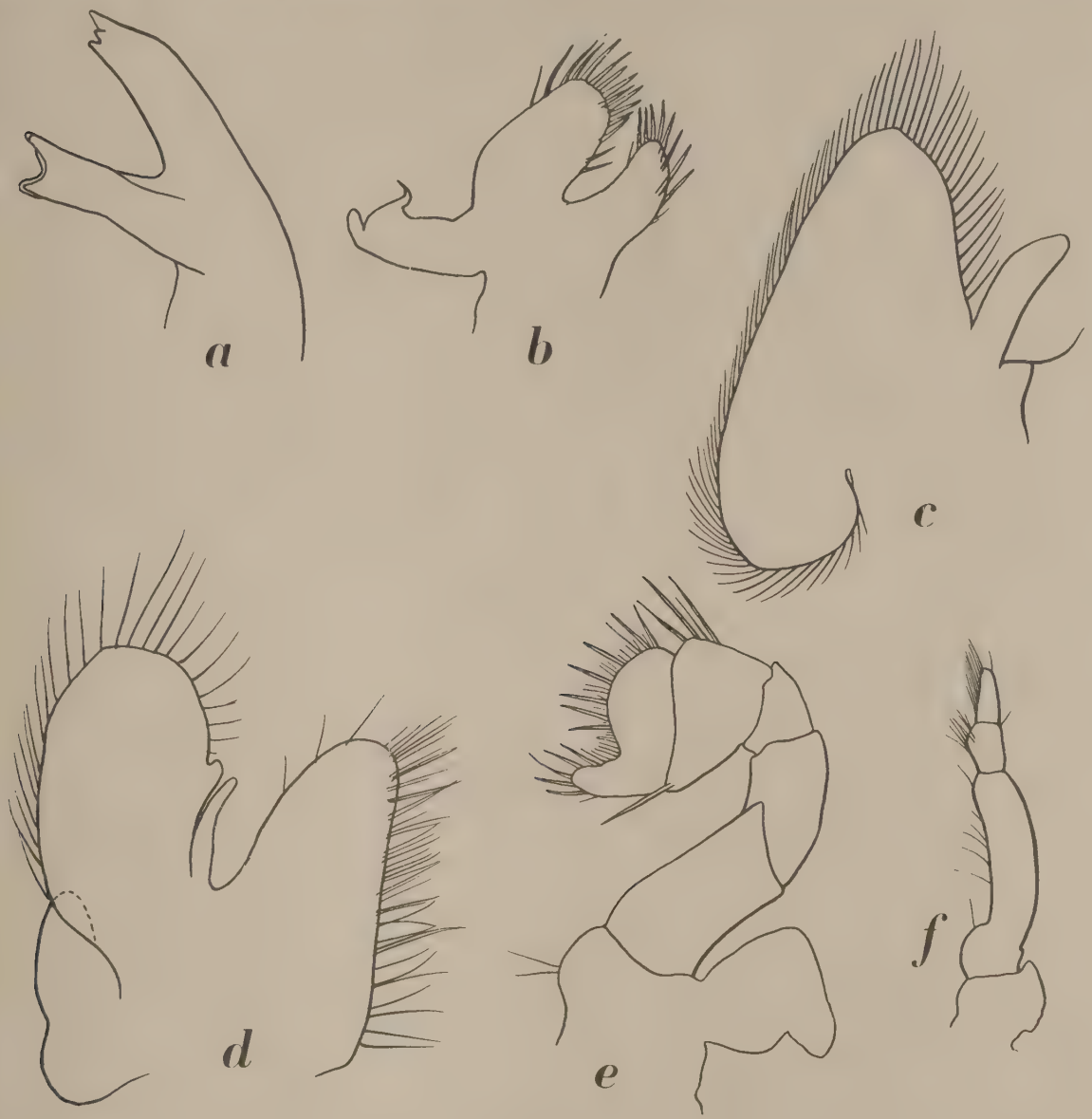


Fig. 109. *Pontonides unciger* Calman. a, mandible; b, maxillula; c, maxilla; d, first maxilliped; e, second maxilliped; f, third maxilliped. a-e, × 80; f, × 34.

of the endite, forming thereby a transition to *Anchistoides,* the palp is well developed, the scaphognathite is rather broad. The first maxilliped (fig. 109d) has the epipod distinct, it is faintly bilobed, the flagellum of the exopod is strongly reduced, the caridean lobe is well developed and broadened anteriorly, the palp is slender, the basis and coxa are not separated by a notch. The second maxilliped (fig. 109e) bears no exopod, the dactylus is produced in its lower part to a slender point, the

other joints are typical in shape, the epipod is well developed, no podobranch is present. The third maxilliped (fig. 109f) reaches slightly beyond the base of the scaphocerite. The last two segments are short, the ultimate is slightly longer than the penultimate. The antepenultimate segment is slender, slightly curved and distinctly longer than the two last joints together. Like in the first and second maxilliped, the third maxilliped bears no exopod. A small but distinct arthrobranch is present at the base of the third maxilliped.

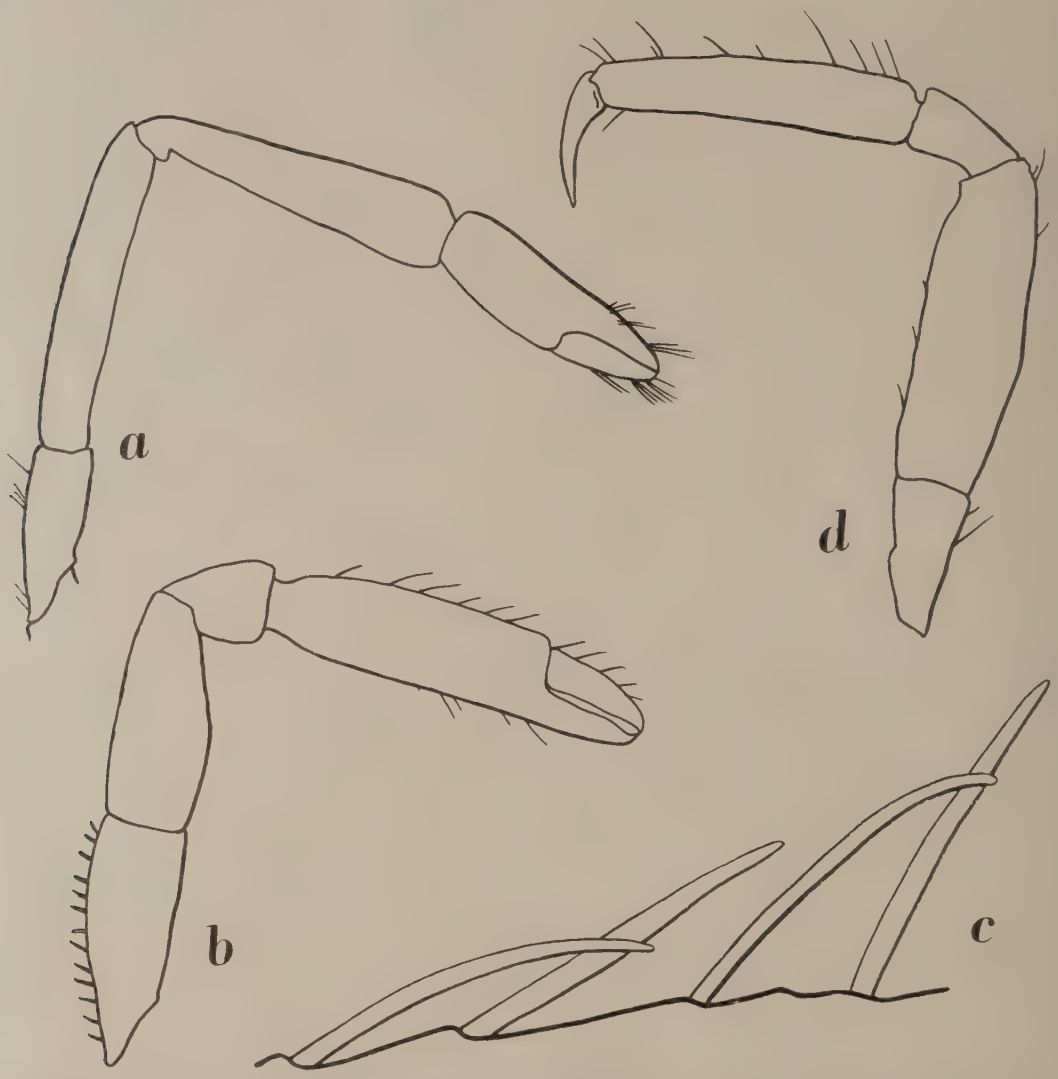


Fig. 110. *Pontonides unciger* Calman. a, first pereiopod; b, second pereiopod; c, hairs on ischium of second pereiopod; d, fifth pereiopod. a, b, d, × 34; c, × 320.

The first pereiopod (fig. 110a) is slender and reaches with the entire chela and carpus beyond the scaphocerite. The fingers are as long as the palm, they are unarmed and have the tips provided with setae. The carpus is about 1.5 times as long as the chela, it is slender and narrows posteriorly. The merus is about as long as the carpus. The ischium is short. Of the second pereiopods (fig. 110b) only the right is present, it reaches with the chela only beyond the scaphocerite. The fingers are

short, they are slightly less than half as long as the palm and bear no teeth. The palm is slender and about thrice as long as broad. The carpus is half as long as the palm, triangular in shape, broadest anteriorly and narrowing posteriorly. The merus is broad and unarmed, it is slightly shorter than the palm and it is subequal to the ischium. The ischium is provided on its posterior margin with strange flat hairs (fig. 110c). The fifth (fig. 110d) pereiopod has the dactylus simple, ending in a strongly curved point. The propodus is more than twice as long as the dactylus, it is unarmed. The carpus measures about $^1/_3$ of the length of the propodus. The merus is slightly shorter, but much broader than the propodus. The ischium is very short.

The uropods are ovate and longer than the telson. The exopod has the outer margin slightly convex, naked and ending in a small tooth.

The present species is most closely related to *Pontonides maldivensis*, from which it differs:

1. in the shape of the rostrum, which in *P. maldivensis* has the lateral margins evenly rounded, while in *P. unciger* they are produced into a distinct angular process.
2. by having the carpus of the first pereiopods longer.

Distribution. The species up till now was known only from the original record by C a l m a n, based on an ovigerous female collected at a depth of 55 m in the southern Red Sea (13° 31′ N, 42° 31′ E).

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ADDENDA ET CORRIGENDA

When the present paper was already in page proof I came across Balss's description of *Dasycaris doederleini* (1924, Arch. Naturgesch., vol. 90 pt. A n. 5, p. 49, fig. 2). As Balss described this species by error as *Dasygius doederleini,* it has been placed in the Zoological Record of 1924 under the Brachyura Oxyrhyncha (Zool. Record, 1924, p. 20), which has been the cause that it was overlooked by me.

page 16, add as second species of the genus *Dasycaris*: *doederleini* (Balss, 1924). Synonym: *Dasygius doederleini* Balss, 1924. Distribution: Sagami Bay, Japan. Depth 130 m.

page 43, before line 2 from bottom, add: *Periclimenes hertwigi* Balss, 1924, Arch. Naturgesch., vol. 90 pt. A n. 5, p. 48.

page 129, before line 17 from bottom, add: *Periclimenes gorgonidarum* Balss, 1924, Arch. Naturgesch., vol. 90 pt. A n. 5, p. 48.

page 145, lines 10 and 7 from bottom, page 146, line 20 from top: "Mier's" should read "Miers's".

page 180, lines 6 and 7 from top, delete: "the only species known of this genus."

page 180, line 13 from top, add: "From *D. doederleini* (Balss) the present species differs in the shape of the rostrum and that of the abdomen."

page 186, lines 26 and 27 from top, delete: "One species ..... studied."

page 187, following line 8 from top, add: *Coralliocaris graminea* Balls, 1924, Arch. Naturgesch., vol. 90 pt. A n. 5, p. 48.

page 189, before line 12 from bottom, add: *Coralliocaris superba* Balss, 1924, Arch. Naturgesch., vol. 90 pt. A n. 5, p. 48.

page 193, following line 19 from top, add: *Coralliocaris lucina* Balss, 1924, Arch. Naturgesch., vol. 90 pt. A n. 5, p. 48.

page 225, following line 18 from top, add: ——, 1924. Die Oxyrhynchen und Schlussteil. (Geographische Uebersicht der Decapoden Japans). Ostasiatische Decapoden. V. Arch. Naturgesch., vol. 90 pt. A n. 5, pp. 20-84, textfigs. 1, 2, pl. 1.

page 251, first column, before line 2 from bottom, add: *doederleini* 16; before line 1 from bottom, add: *Dasygius doederleini* 16.

Pontoniinae associated with other marine invertebrates ↓

Marine Invertebrates associated with Pontoniinae →

| Pontoniinae | Porifera | | |